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February 1989

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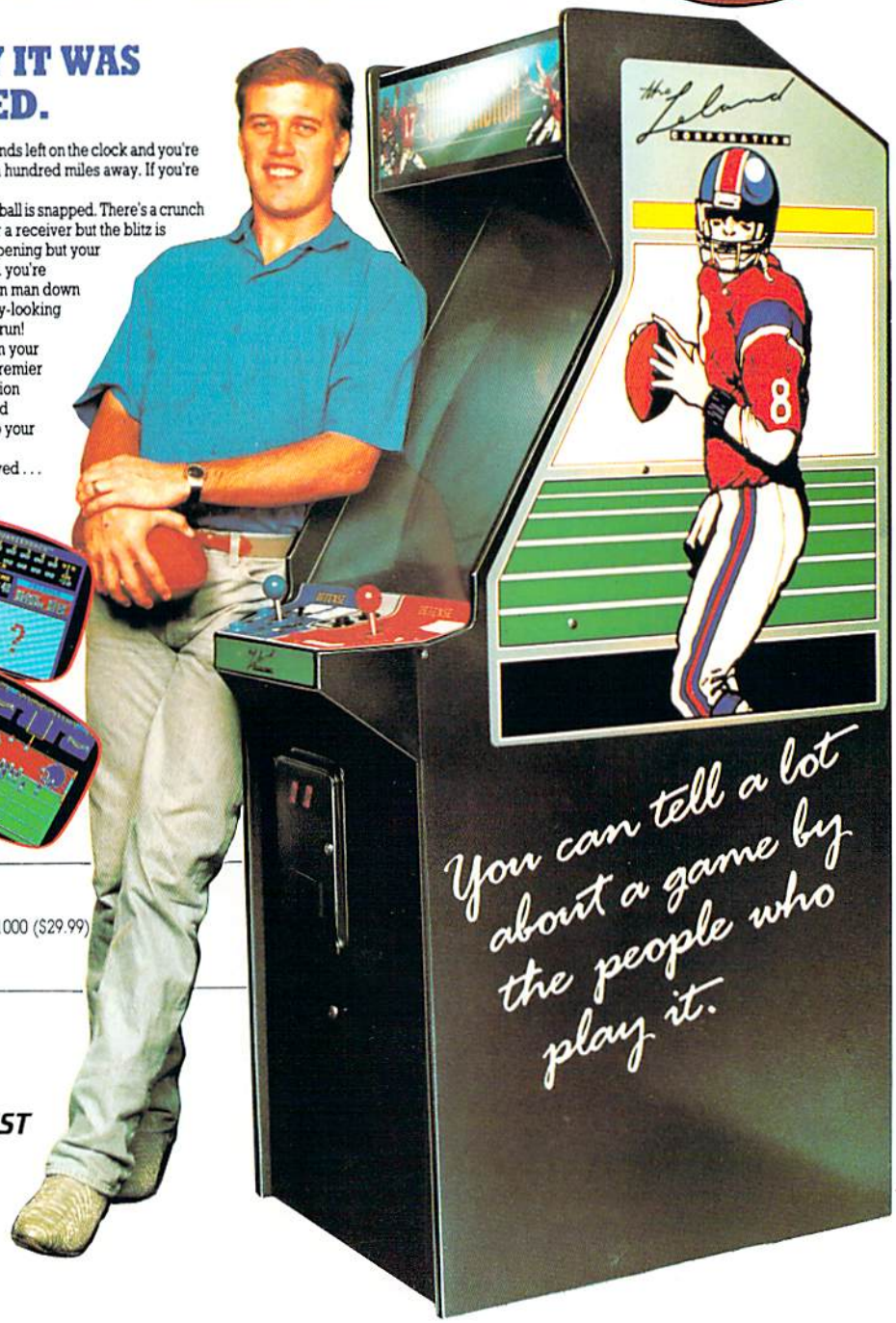

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COMPUTE!'s GAZETTE

February 1989 Vol. 7, No. 2

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editor's notes

A special thanks to those readers who have mailed in responses to *Gazette*'s "Readership Survey," found in the December issue. At this writing, the results are being tallied. We've already seen 700 responses and more are coming every day. If you're a regular reader and you haven't sent in your survey sheet, it's not too late. It's your chance to tell us all about your needs and plans, and what you like or don't like about *Gazette*. In the next month or two, we'll take a look at the final results in this column.

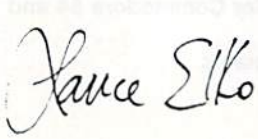
It's evident from the user group newsletters we receive and from the 700 survey responses that a growing number of 64 and 128 users are buying Amigas. If you're in that group, we have some exciting news. COMPUTE! Publications is launching a regularly scheduled Amiga-specific publication in a few months. *COMPUTE!'s Amiga Resource* will be brought to you by many of the same people that produce *Gazette*—me, Rhett Anderson, and Randy Thompson, to name a few.

We decided not to incorporate Amiga coverage into *Gazette* because of the obvious diluting effect. (Besides, what do these machines have in common, other than the manufacturer?)

We named our new magazine *Amiga Resource* because that best describes what we've planned it to be—a true resource, packed with information you'll refer to time and again. We're still nailing down a few last-minute details, but we can tell you about what's in each issue: in-depth features, incisive software and hardware reviews, up-to-date buyer's guides, technical tips, and a wide variety of must-read columns. Our regular columnists (so far) include Sheldon Leemon, John Foust, Rob Peck, Shay Addams, Jim Butterfield, Arlan Levitan, and our own Rhett Anderson and Randy Thompson. We will also be offering a companion disk with each issue. This disk, packed with exciting programs (written in a variety of languages), animation, and art, will be available separately by subscription or by single order; in addition, certain Amiga dealers will offer it bundled with the magazine. If you'd like more information on our new Amiga magazine, send a postcard with your name and address to *COMPUTE!'s Amiga Resource*, ABC Consumer Magazines, 825 Seventh Avenue, 8th Floor, Department BT, New York, New York 10019.

In this issue, you'll find an exciting program, "The Great Arcade Machine." This interactive tool lets you design your own machine language–speed game through BASIC. The only restriction is your imagination. It's all here: animation, sound, collisions, color, and joystick control. In fact, we're so anxious to see what you can do that we're running a contest with cash prizes for those who design the best games with this program. (See page 57.)

In this month's lead feature, "Around the World with Commodore," Tom Netsel explores the global Commodore community. It's a fascinating story about Commodore enthusiasts in Japan, Costa Rica, India, Mexico, Colombia, and Sweden. This feature warmly illustrates that in spite of the natural language barriers, we're all speaking the same tongue when it comes to Commodore computers.



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Senior Editor

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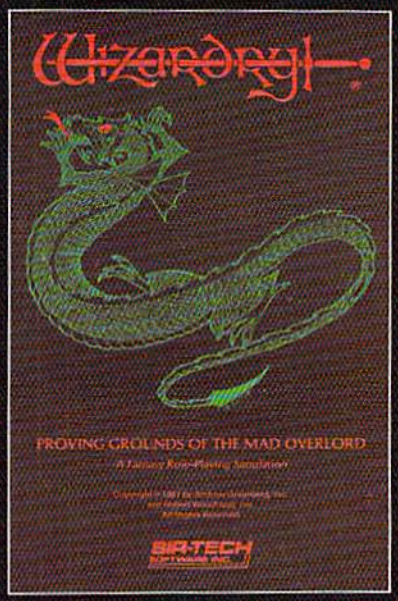

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letters to the editor

Send questions or comments to Letters to the Editor, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We reserve the right to edit letters for clarity and length.*

Gorbachev Made Us Do It

I just read "88's Best Games" (December) and I am appalled that you selected a Russian arcade game over *Bard's Tale III: Thief of Fate*. I received more enjoyment from *BTIII* than I did when I achieved Colonel in *Gunship*.

Payton Byrd
Dover, TN

As explained in the December "Editor's Notes," we conducted a secret poll of Gazette *staff and regular reviewers. Software titles with the most votes made our final list. (Ironically, a democratic process picked a product from a Communist country. Maybe* Glasnost *is spreading.)* Bard's Tale III *was cited by a few, but it did not receive as many votes as the seven finalists.*

Resurrection

I'm 53 years old and totally disabled with emphysema. All my relatives and friends thought I had come home to die. I thought, *Not me*, and I then bought my first computer, a VIC-20, and started from scratch, teaching myself how to program with the help of a *COMPUTE!* subscription. It relieved all my stress and helped me learn to control my anxiety and depression. After a couple of years, my VIC broke down, so I bought a 64 and started over again. I signed up for a *Gazette* subscription. I now have a new outlook on life, thanks to Commodore and *Gazette*. Last August I bought a Commodore Turbo Colt PC, but I still like my 64 and use it a lot. I just signed up for a *COMPUTE's PC* subscription. Just thought I'd share my story with the people that saved my life.

Eldon H. Stevenson
Greeley, CO

Reader Tips

I found "128 Shell Booter" (August) to be very helpful. To make this program even faster and easier to use, I used the Autoboot Maker program on the 1571 Test/Demo disk on SHELL.BOOTER, and now it autoboots the DOS Shell on double-sided disks. All I have to do is turn on the 128, and in less than seven seconds the Shell is booted. I've done this with all my double-sided disks without any problems. When running Autoboot Maker, just be sure to tell the program that SHELL.BOOTER is a binary, not a BASIC, file.

William Engel
Dumont, NJ

I've noticed in several recent computer magazine issues that many Commodore users are having problems after buying a second disk drive because they can't switch it to device 9 very easily. I have a suggestion: When buying a second drive, try to locate a 1541-II. These drives have a switch on the back panel to change device numbers.

Jeremy Rusnak
Sarver, PA

Writing It Right in French

I'm writing in response to the letter from Daniel Girard in the November issue. For those who want to do word processing in French, I can highly recommend *Traitex 64/128*, from Logical Vision Software. It is marketed by Télémédiatique, 451 Rue St.-Jean, Montréal, Québec, Canada H2Y 2R5. A few of its features are all 13 accents supported on screen and printer, 95,000-word English dictionary, 250,000-word French dictionary, and mail merge. The program is 100-percent bilingual, with manuals in both English and French. (I've found out the hard way that my Seikosha SP-1000VC doesn't have international characters, so if I'm writing in NLQ mode, the printer will switch over to graphics mode to insert accent marks.

Steve Mills
Grand Haven, MI

More on Excel Upgrade

After reading the "Excel No More" letter in the December issue, I became interested in the upgrade chip for the Excel-2001 disk drive. Where can I get the chip, how much does it cost, and how can I install it in my disk drive?

Frank Brower
Trenton, NJ

You can get the new chip, which increases the speed of the drive by 20 percent, directly from Surfside Components, the Excel drive manufacturer. The cost is $19.95. David English, Surfside's contact person for all 2001 matters, told us that installation is simple, a matter of removing about nine screws, popping out the old chip, inserting the replacement chip, and replacing the screws. The chip can be ordered through Surfside's toll-free number, (800) 548-9669, or by writing Surfside Components International, 262 Nehf Lane, Soquel, California 95073. English told us that he'd be happy to talk with any readers with questions about the 2001 drive or the replacement chip.

1764 and 128 Compatibility

I read Mary E. Wilson's letter (November) with a great deal of sympathy. I like Commodore products, but have my doubts about the people running the show. I considered buying a 1700 REU myself, but thought the 1764, for a few dollars more, with twice the memory, was a better choice. As I was not certain it would work with my 128 and GEOS, I wrote letters asking for information as to the compatibility. I got answers from no one, including Berkeley. I took a chance and bought a 1764 anyway, and despite Commodore's statement that the 1764 was designed only for the 64 and *cannot* be used with the 128, I have used it with GEOS for about a year now with no problems. If my letter to *Gazette* had been answered, it might have saved Mary Wilson and her users' group some needless expense and disappointment.

Richard Weller
Spencerport, NY

Correct—we're using a 1764 with the 128 here at COMPUTE! without problems. Apparently, Commodore intended for the 1764 to be purchased by 64 users, because the company includes a heftier 64 power supply with each 1764 package (the older power supplies cannot withstand the extra power drainage with the 1764 installed).

As to our not replying to or publishing your letter, we're sorry. On our behalf, we should note that we could fill an entire issue—on a monthly basis—with all the letters we receive. We do our best to handle as much mail as we can while still publishing a monthly magazine.

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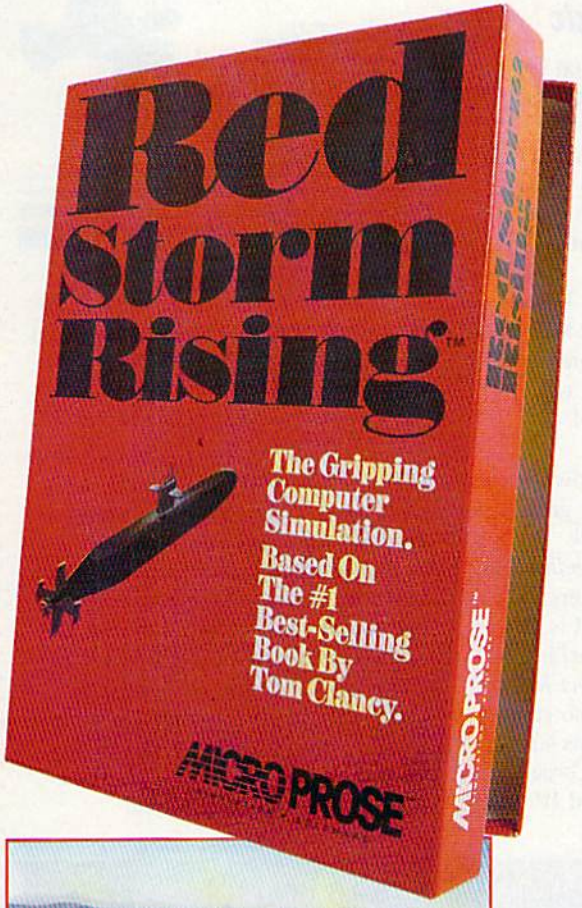

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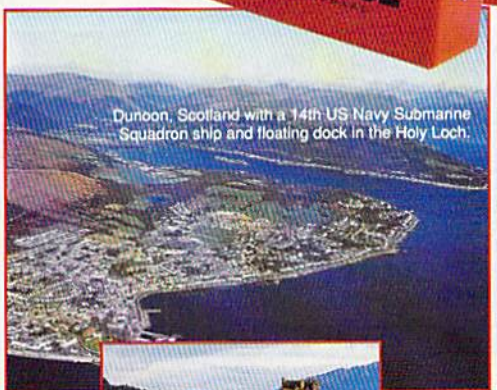
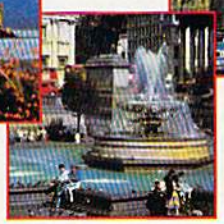
To enter, obtain your *Official Log Form* and complete *Rules* by sending a letter or postcard to the *Red Storm Rising* Board of Naval Examiners, 180 Lakefront Drive, Hunt Valley MD 21030. While you're waiting for the *Official Log Form*, start playing the full *Red Storm Rising* campaign game and learn to achieve maximum Efficiency Rating (ER). You can protect the ER of your campaign in progress by choosing the "Computer Log" option at the "Contact Screen" (see below) preceding each battle, and then saving your game. If your performance in the ensuing contact does not meet your standards, you can re-play it (before going on to another battle) without losing your previous score.

On the *Official Log Form* you will fill in the details of each of your most successful battles in your best campaign. The deadline for the Board of Naval Examiners to **receive** your entry — your completed *Official Log Form* and final game save disk — is March 31, 1989.

The Board of Naval Examiners is making every effort to ensure that the *Red Storm Rising Ultimate Challenge* is a fair test. As you proceed into the higher levels of competition, the Board of Naval Examiners will advise you of specific examination procedures. If you intend to win you must be available for certain arrangements during the weeks of April 10 and 17, 1989, and on April 30 and May 1, 1989.

The *Rules*, included with your *Official Log Form*, explain the details.


Dunoon, Scotland with a 14th US Navy Submarine Squadron ship and floating dock in the Holy Loch.



Contact Screen

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Red Storm Rising by Tom Clancy © 1986 by Jack Ryan Enterprises Ltd. and Larry Bond.

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

By Mickey McLean

Janice R. Fary

Okidata Speaks Up

User groups nationwide can now contact Okidata (532 Fellowship Road, Mount Laurel, New Jersey 08054) and its new Speakers Bureau for group speaking engagements.

Speakers will be drawn from the company's national sales organization, and their presentation will address Okidata's history, product line, and customer-service support program. An audience question-and-answer period and a product demonstration will follow the presentation. Corporate literature will also be available.

"We feel that this is a very effective vehicle for educating end users about our company," said Edward Golderer, vice president of marketing. "Their questions can be answered directly, and we will learn more about their printer needs on a firsthand basis."

Written inquiries should be addressed to Cliff Rockwell, manager of public relations.

Lucasfilm Games Sees the Light and Magic

Lucasfilm has announced that its Games Division has become a part of Industrial Light and Magic. ILM, known for its cinematic special effects, and Games will combine to create state-of-the-art applications of computer animation and computer simulation for games.

"By combining Games' knowhow in interactive design with ILM's visual magic, we can create a whole new dimension in entertainment," said Douglas Norby, president of Lucasfilm.

Lucasfilm Games is known for its line of simulation and story games including *Maniac Mansion, Zak McKracken and the Alien Mindbenders,* and *Battlehawks 1942.* Winners of eight Academy Awards, ILM is known for its work on Lucasfilm's *Star Wars, Willow,* and *Indiana Jones* movies. The division has also created visual special effects for films such as *Who Framed Roger Rabbit?, Cocoon, E.T.,* and *Star Trek II, III,* and *IV.*

Drawing from the 128

A complete drawing system designed for the Commodore 128 and 1351 mouse has been released by Free Spirit Software (P.O. Box 128, 58 Noble Street, Kutztown, Pennsylvania 19530). *Sketchpad 128* ($29.95) takes advantage of the 128's 80-column graphics capabilities.

The program can create 80-column artwork, slide shows, signs, posters, and letterheads. In addition to a 128 or 128D computer, *Sketchpad 128* requires a 1351 mouse, a 1571 disk drive, and an 80-column RGB monitor. A second disk drive and 64K of video RAM are optional. The 1581 disk drive is fully supported.

Commodore Climbs

Commodore has reported a 52-percent profit increase for its fiscal first quarter of 1989, according to the *Wall Street Journal.* This continues a trend of increased profits since the company suffered losses three years ago.

Commodore reported a net income of $9.6 million, or 30 cents per share, for its quarter ending September 30, 1988. These figures show an increase from the $6.3 million, or 20 cents per share, from last year. Sales also rose 15 percent, from $173.9 million to $200.2 million.

Irving Gould, Commodore chairman, credits the company's success to its expanded product mix including its line of Amiga computers and PC compatibles in addition to the 64 and 128.

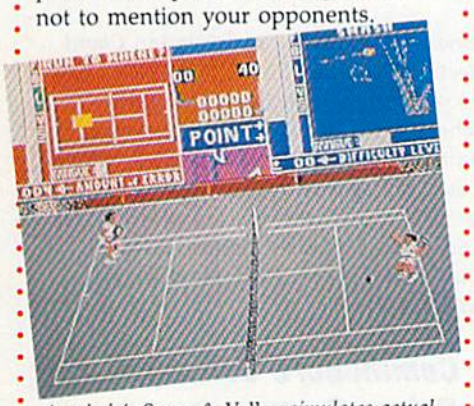
COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

Games People Play

Each month, *Commodore Clips* beats the bushes of software publishers to find out what's new in the world of Commodore 64 and 128 entertainment software. This month we'll take a look at the latest titles in the category of sports games. Actual simulations of the games we (or our heroes) play and arcade-style athletic titles are coming from the software publishers in droves.

Taking It to the Streets. Epyx (600 Galveston Drive, P.O. Box 8020, Redwood City, California 94063) has recently released its latest entry in the Street Sports series. *Street Sports Football* ($19.95) puts you in the middle of a gridiron battle on the neighborhood streets or at a construction site. To make it safely to the end zone, you'll need to dodge oil spills, trash cans, parked cars, potholes, and puddles, not to mention your opponents.



Accolade's Serve & Volley *simulates actual tennis action.*

You choose your three-man team from a group of neighborhood rowdies, each possessing a certain football talent. You can either pick plays from a playbook or create your own. The only thing missing is the dirt to draw them in. You also set your own rules before the game.

Street Sports Football is joystick-controlled and can be played at a beginner or an advanced skill level against either the computer or a rowdy from your own neighborhood.

Tennis Everyone? Accolade's *Serve & Volley* ($29.95) simulates the action on the tennis courts. You must make careful stroke selections and correct ball placements, possess accurate timing, and anticipate the correct court position after each ground stroke, volley, and serve.

The Strobe-O-Stroke feature from Accolade (550 South Winchester Boulevard, Suite 200, San Jose, California 95128) consists of action windows with animated racket movement that allows you to time each hit or serve.

Battle the world's top drivers in Accolade's Grand Prix Circuit.

You can choose from several different serves or ground strokes and play the game at the beginner, intermediate, or advanced level. Other game options include a choice of court surfaces and either match or tournament play.

Player attributes in this one- or two-player game can be adjusted for endurance versus speed, forehand versus backhand, and power versus accuracy. You can also save player statistics to use in a computer-controlled match or tournament based on those statistics. Each match or tournament can be saved or resumed.

Off to Monaco. In the tradition of its successful driving simulation, *Test Drive*, Accolade has released *Grand Prix Circuit* ($29.95), a racing simulation based on the Formula One series.

You can choose to represent either the McLaren, Ferrari, or Williams team at Monaco, Japan, Detroit, Germany, or four other track layouts. In addition to team and track choice, your options include three modes of play—qualifying lap, single race, or Grand Prix Championship—and a choice of difficulty levels ranging from beginner to expert.

Once you have made your selections, you must qualify your car in a field of ten cars. You then race to accumulate points against the other nine, each with its own personality and driving characteristics, to become the world driving champion.

Features that add to the realism of the game include cars that show damage after mishaps on the track, functional rear-view mirrors, accurate representations of each track including overpasses and tunnels, and authentic background scenery of each city.

As in true Formula One racing, you'll need to make pit stops, which must be timed perfectly so that you don't lose your position on the track.

EA's Caveman Ugh-Lympics *provides real head-bashing action.*

Go for the Ugh! Electronic Arts (1820 Gateway Drive, San Mateo, California 94404) has set the Olympic Games back thousands of years with *Caveman Ugh-Lympics* ($29.95). In this prehistoric athletic competition, you are challenged in six unique events. But first you must choose from six Neanderthal athletes to portray on the computer screen, each having personal strengths and weaknesses.

Each event requires special skills and tricks that must be learned before you can claim to be the Carl Lewis of the cave set. Learning the overhead smash and the knee swing will improve your score in the Clubbing

COMMODORE CLIPS

NEWS, NOTES, AND NEW PRODUCTS

event. You can even try to fool your opponent with the old look-at-the-pterodactyl-in-the-sky trick. A bad vault in the Dino-Vaulting competition provides lunch for the triceratops. Unsportsmanlike conduct is permitted in the Sabertooth Tiger Racing event as you try to trip your opponent.

The final three events require even more skill. To win the Mate Toss, you must heave your partner the farthest. In Firemaking, you must rub your sticks the fastest to get a spark, and you must remember to duck when your opponent tries to club you in the head. The grand finale is the Dinosaur Race, in which you must ride and prod your dinosaur to beat the other cavemen to the finish.

Winners receive Ugh-Lympic medals and can earn the ultimate honor—induction into the Cave of Flames.

Award Winner

The Computer Game Developer's Conference has selected Origin (136 Harvey Road, Building B, Londonderry, New Hampshire 03053) as the inaugural recipient of its Best Publisher Award. The conference, which is held annually in California, unites the world's top computer game designers as they share their opinions on the state of the entertainment software industry.

Origin, publishers of the Ultima series, came home with the top honors, which pleased company president Richard Garriott.

"This is by far the most exciting award we have ever won," Garriot said.

Sponsored by computer game designers Chris Crawford and Stephen Friedman, the Computer Game Developers Conference attracted over 150 designers and programmers.

Guitarists Only

Guitar students and teachers with Commodore 64s may be interested in *Chord Printer*, a product from The Guitar Connection (P.O. Box 221H, Scarsdale, New York 10853). *Chord Printer*, a menu-based program, is a dictionary of guitar-chord fingerings of 19 of the most-used chord types in popular music. Fingerings for major, minor, sus2, sus4, augmented, major 6, minor 6, major 7, minor 7, and other chords can be selected (the user can specify the root note and string for moveable chords). *Chord Printer* shows any user-selected chord finger display—open or moveable—onscreen and offers a printout option. Printout options of staff paper, tablature paper, and blank fretboard diagrams are also offered from the menu. *Chord Printer* retails for $14.95.

The Expanding World of Commodore

Commodore has announced a third World of Commodore show to be held May 18–21 in Los Angeles. Other World of Commodore events are held annually in Toronto and Philadelphia. Last December's show in Toronto was its sixth annual, while last fall's expo in Philadelphia was the first to be held in the United States.

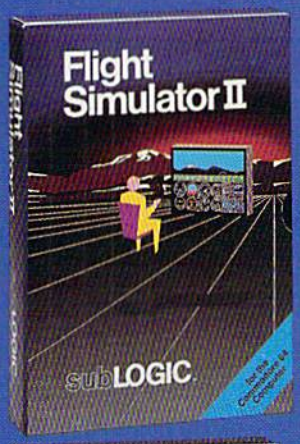
The show is sponsored by Commodore, which also acts as a major participant with a large display booth, seminars, and stage presentations.

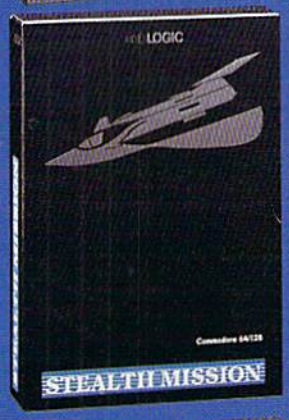
The spring show is being held in the Los Angeles Convention Center.

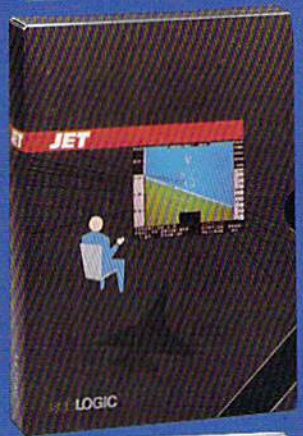
Commodore Software Sales: Games

A Software Publisher's Association study shows that software sales in the third quarter of 1988 were up 42 percent over the previous year, according to a report in the *Software Industry Bulletin*. Commodore 64 and 128 software sales were down 1.4 percent from third quarter 1987 figures, but they showed an increase of 8.7 percent over 1987 totals in the category of recreation games sales. The study also showed that sales of MS-DOS programs grew to claim 77 percent of the dollar total for all software sold, up 47 percent over 1987 figures.

Illustrations by Janice R. Fary







FLIGHT SIMULATOR

$49.95

Nearly 1.5 million copies of this classic, premium flight simulation program have been sold to date, and there's still nothing even close to it. Compatible with SubLOGIC Scenery Disks.

STEALTH MISSION

$49.95

Winner of the 1988 CES "Best Strategy Game" Software Showcase Award. This advanced-technology strategic simulation is a stunning success, with sales challenging those of Flight Simulator. With nothing comparable on the market (despite similar titles), Stealth Mission's programming polish and strategic gaming excellence set new industry standards. Scenery Disk compatible.

JET

$39.95

This award-winning jet fighter simulator defines the state of the art in action/combat simulation. Exciting and beautiful carrier-based sea missions complement multiple land-based combat scenarios. Jet's quick-reading documentation and easy flight controls provide unequalled action and fun. Scenery Disk compatible.

Special "Discover the World of SubLOGIC" promotional packaging:

* Jet for the Commodore 64/128 now includes a FREE beautiful Japan Scenery Disk, a $24.95 extra value!

* Jet is also available without Japan Scenery Disk for the special low "discover SubLOGIC" price of $29.95 through selected discount channels.

SCENERY DISKS

$24.95 each. For use with all SubLOGIC flight simulation products.

WESTERN EUROPEAN TOUR
Our latest and hottest! Detailed scenery covering southern Great Britain, northern France, and southern West Germany. The basis of our fun "Find Red Square" promotion.

JAPAN SCENERY DISK
Detailed scenery from Tokyo to Osaka. Delightful international adventure!

SAN FRANCISCO
Concentrated scenery covering San Francisco and the Bay area. A consistently best-selling favorite!

SCENERY DISK # 7
Eastern Seaboard. Includes: Washington, Charlotte, Jacksonville, Miami. Another best-seller!

SCENERY DISK # 11
North-Eastern Border. Includes: Detroit, Lake Huron. Incredible variety, from industrial Detroit to beautiful Niagara Falls!

See your dealer, or write or call for more information. All products are available on disk for the Commodore 64/128 computers. For direct orders please indicate which product you want, and enclose the correct amount plus $2.50 for shipping and handling ($1.50 for each additional package). Please specify UPS or first class mail delivery. Visa, MasterCard, American Express, and Diners Club charges accepted.

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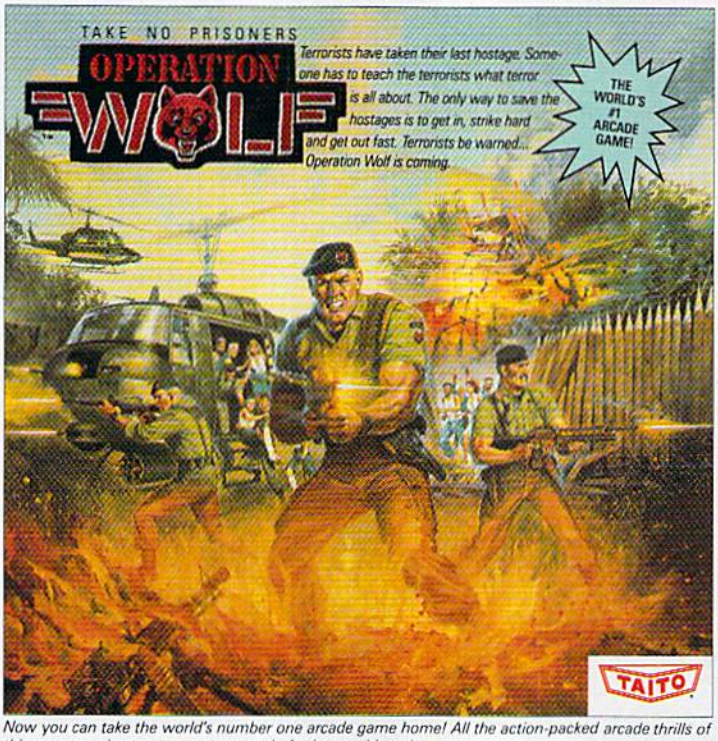
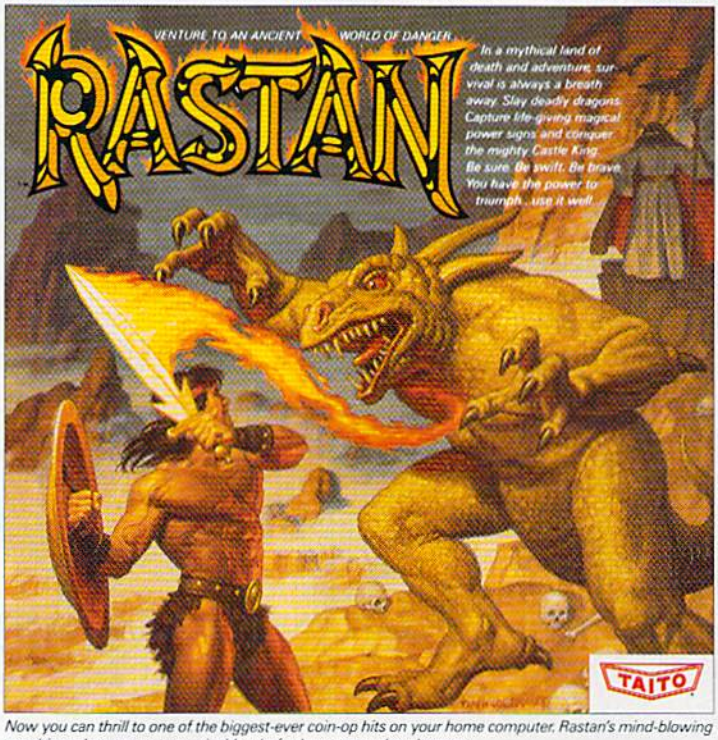
SEVEN WAYS TO MAKE YOUR COMMODORE SCREAM

1) EXPLOSIVE COMMANDO RAIDS.


TAKE NO PRISONERS
OPERATION WOLF
Terrorists have taken their last hostage. Someone has to teach the terrorists what terror is all about. The only way to save the hostages is to get in, strike hard and get out fast. Terrorists be warned... Operation Wolf is coming.
THE WORLD'S #1 ARCADE GAME!
TAITO

Now you can take the world's number one arcade game home! All the action-packed arcade thrills of this awesome hostage rescue are ready for home video play.

2) SUPER-HUMAN WARRIOR LORDS.


VENTURE TO AN ANCIENT WORLD OF DANGER...
RASTAN
In a mythical land of death and adventure, survival is always a breath away. Slay deadly dragons. Capture life-giving magical power signs and conquer the mighty Castle King. Be sure. Be swift. Be brave. You have the power to triumph...use it well.
TAITO

Now you can thrill to one of the biggest-ever coin-op hits on your home computer. Rastan's mind-blowing graphics takes you to a magical land of adventure and excitement.

THE ONLY GAME IN TOWN™

TAITO

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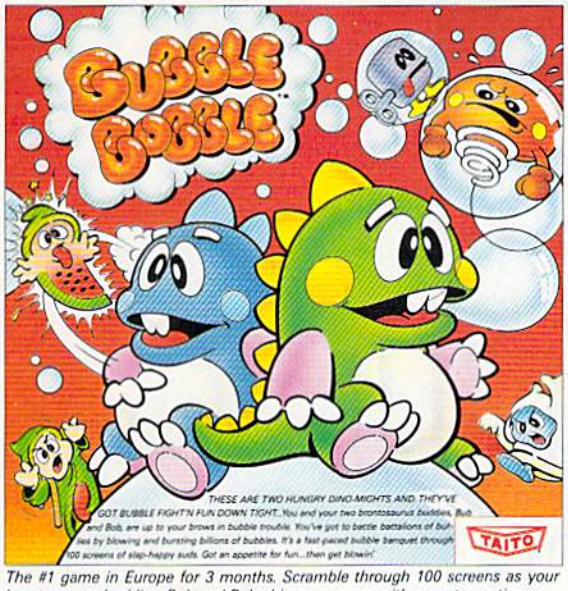
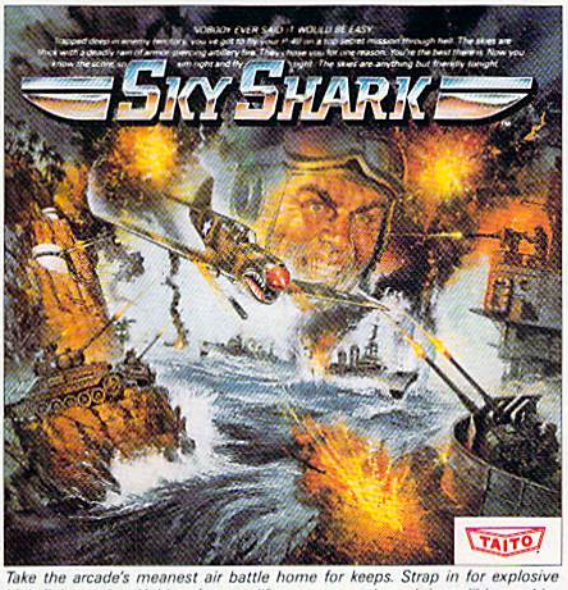
COMING SOON, THE CLASSIC MIND GAME, QIX.

3) BUBBLE BLOWING DINOSAURS.


BUBBLE BOBBLE
THESE ARE TWO HUNGRY DINO-MIGHTS AND THEY'VE GOT BUBBLE FIGHT'N FUN DOWN TIGHT...You and your two brontosaurus buddies, Bub and Bob, are up to your brows in bubble trouble. You've got to battle battalions of bubbles by blowing and bursting billions of bubbles. It's a fast-paced bubble banquet through 100 screens of slap-happy suds. Got an appetite for fun...then get blowin'.
TAITO

The #1 game in Europe for 3 months. Scramble through 100 screens as your brontosaurus buddies, Bub and Bob, drive you crazy with non-stop action.

4) DEATH-DEFYING ACES.

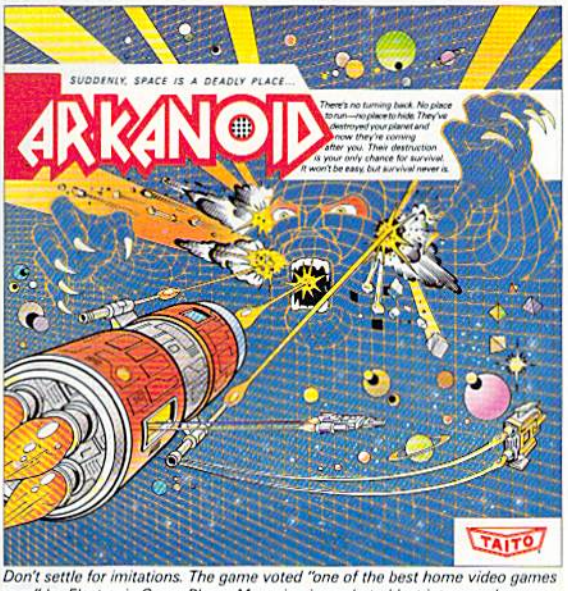


Take the arcade's meanest air battle home for keeps. Strap in for explosive high-flying action. Hold on for your life as you soar through incredible graphics.

5) INTER-PLANETARY WARFARE.

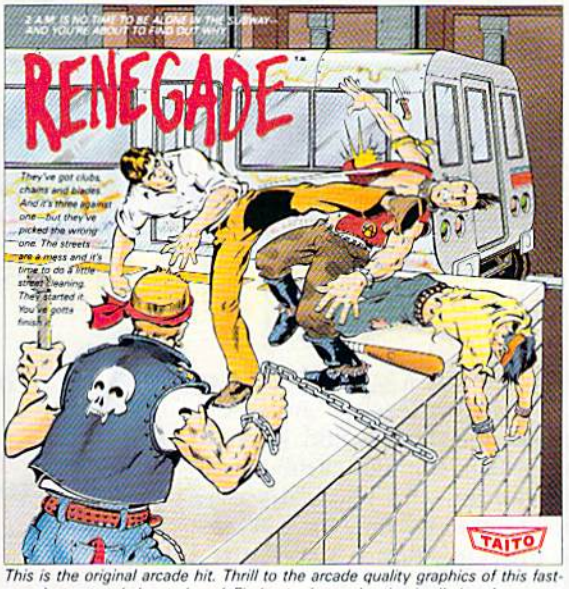
Now you can blast into one of the hottest arcade space games right in your own home. It's the ultimate inter-planetary combat. You've never seen action like this.

6) OUTER SPACE GRID MONSTERS.


SUDDENLY, SPACE IS A DEADLY PLACE...
ARKANOID
There's no turning back. No place to run—no place to hide. They've destroyed your planet and now they're coming after you. Their destruction is your only chance for survival. It won't be easy, but survival never is.
TAITO

Don't settle for imitations. The game voted "one of the best home video games ever" by Electronic Game Player Magazine is ready to blast into your home.

7) RAGING STREET RUMBLES.


2 A.M. IS NO TIME TO BE ALONE IN THE SUBWAY... AND YOU'RE ABOUT TO FIND OUT WHY!
RENEGADE
They've got clubs, chains and blades. And it's three against one—but they've picked the wrong one. The streets are a mess and it's time to do a little street cleaning. They started it. You've gotta finish it.
TAITO

This is the original arcade hit. Thrill to the arcade quality graphics of this fast-paced, street-style karate brawl. Find out what real action is all about!

Taito games will make your Commodore scream with the sights and sounds of arcade action, adventure, survival, destruction, heroes, villains and heart-pounding thrills.

These are the world famous arcade originals and they're ready to wail on your Commodore. Arkanoid,™ Alcon,™ Bubble Bobble,™ Operation Wolf,™ Rastan,™ Renegade™ and Sky Shark™ will make your Commodore do things you didn't think were possible.

Everyone knows that arcade games are the benchmark for all other video games and Taito has been an arcade leader since 1953. Since then we've made over 1,000 classics for arcade and home play. Count on Taito to bring the heat of the arcade to your home computer.

Buy Taito products at leading stores everywhere. Visa/MasterCard holders can order direct anywhere in the U.S. by calling 1-800-663-8067.

AROUND THE WORLD WITH COMMODORE

Tom Netsel

The Commodore 64 is the world's most popular home computer. Sales have topped 7 million, but despite the size of this global community, it's amazing how similar Commodore users really are.

At first glance, a Japanese carpenter, a Swedish teacher, and a Colombian teenager would seem to have little in common. Probe deeper, however, and you'll discover that, in our story, they have at least one unifying bond: a well-used Commodore 64 or 128.

While their languages, customs, and lifestyles vary widely, millions of Commodore owners have a great deal in common when they sit down at their computers. They like to write programs, play the latest games, publish newsletters, or keep a database on the members of their user group. In many respects, Commodore owners from any part of the world are just like the Commodore owners in your neighborhood.

Cali, Colombia

In the summer of 1987, two high school students and a university student in Cali, Colombia, formed a Commodore user group. Carlos Rebolledo, 17; Diego Cardenas, 17; and Juan Lopez de Mesa, 20, wanted an organization that would give 64 and 128 users in their community a source of computer hardware and software information.

They decided on the name ComSoft, and now the group has about 30 members, ranging in age from 7 to 50 years old. Some of the members use their computers in business, but most use them in school for projects and at home for entertainment.

ComSoft started the first computer bulletin board system (BBS) in Cali, a city in western Colombia near the Pacific coast. The BBS, ModemComm, which operates on a 128 and three 1541 disk drives, is similar to boards popular in the U.S. Features include download and upload sections, tricks and tips, listings of used computers and peripherals for sale, and software reviews. Most members were unfamiliar with modems when the board began, but more experienced club members have taught the others how to use them.

Members meet twice a month to discuss computers and software. Programs typed from magazines such as *Gazette* are a popular source of inexpensive software. English-speaking members explain how to use the programs to other club members.

There are no official Commodore dealers in Colombia, and the stores that sell 64s and 128s rarely have personnel trained to offer support after the sale. ComSoft members rely heavily on each other,

other user groups, magazines, and commercial-software support lines to help answer computing questions.

ComSoft, managed only by its members, now buys and sells used computer equipment and peripherals. It recently was named the second best small business in the city of Cali in a competition sponsored by a local university.

Members have won other awards as well. Cofounder Diego Cardenas entered and won third place in a state science fair. His experiment consisted of controlling electrical lights and appliances around the house with his 128.

Most software is imported from the U.S., and the favorite games and applications of Comsoft members include some familiar titles: GEOS, *The Print Shop, The Newsroom, PrintMaster, Gunship, F-15, SkyFox, Flight Simulator II,* and *GhostBusters.*

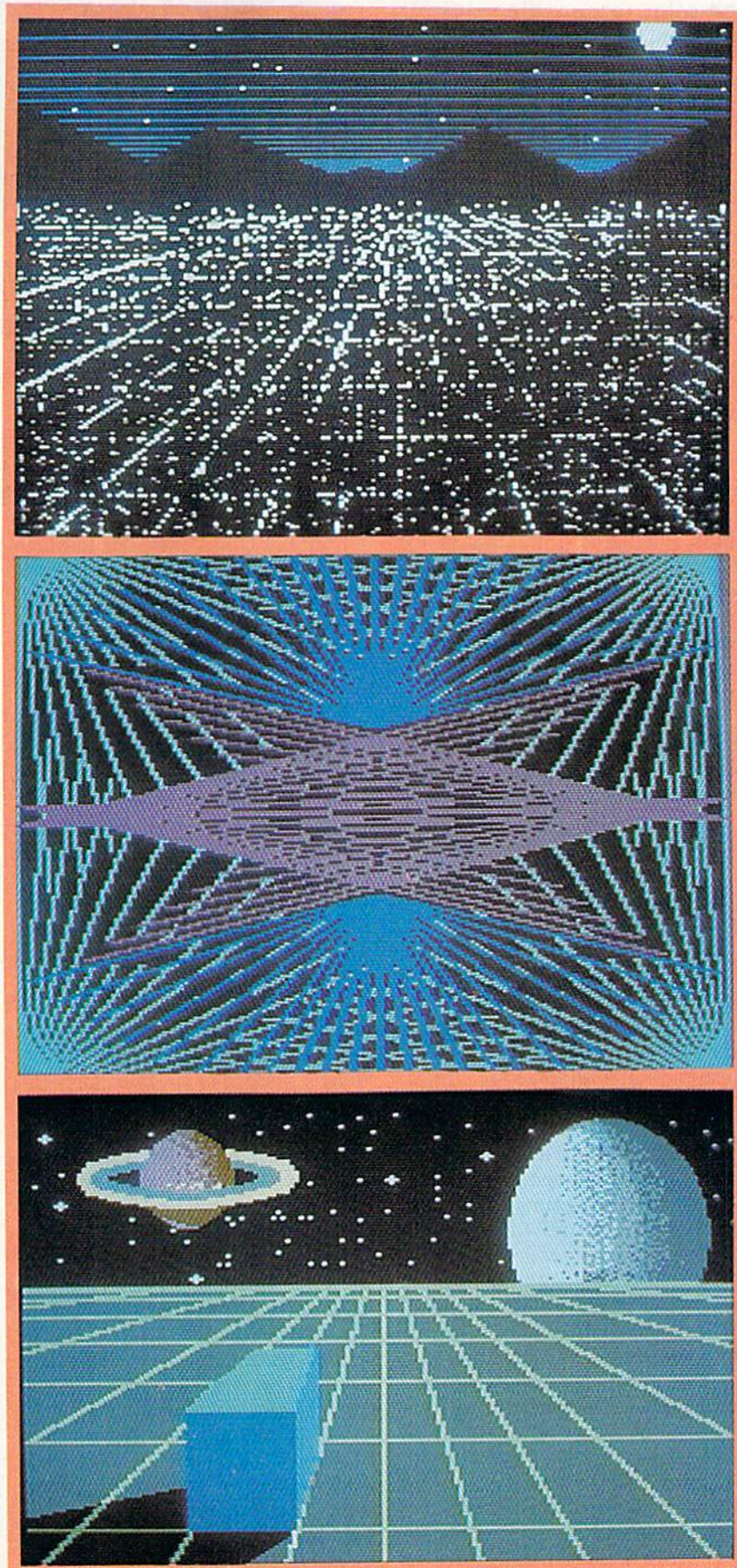
Tibas, Costa Rica

Club Commodore de Tibas is a group for Commodore users who live near the Costa Rican cities of Tibas and San Jose. The group was founded more than a year ago by its president, Marvin Vega. The group's first interests were games and graphics, but these have broadened into a wide range of hardware- and software-related issues.

Few stores in this Central American country sell Commodore equipment. And they offer little support, so this role is assumed by the user group. "We stand alone in defense of our brand against the main forces in the local market—Apple and IBM clones," Vega says. Members are proud of their computers and their club. To further promote this pride, club members have their own T-shirts, emblazoned with the Commodore logo.

The club imports most of its equipment and software, despite the high cost and higher tariffs. A used 64 with a 1541 disk drive sells for about $300. Occasionally, a friend who is visiting the United States will pick up disks or cartridges for other members.

Once a month, the club meets at a member's house to share ideas and swap computer magazines. In addition to the U.S. publications, *INPUT,* from Spain, is popular with the 64 and 128 users. They also try to keep abreast of foreign dealers



Some artwork by 12-year-old Leo Castro, Costa Rica's Club Commodore de Tibas resident artist. Designed with **Micro Illustrator,** *Leo's art is titled (top to bottom): Noche, Design, and Luna.*

who offer reasonable rates for equipment and service.

Through *Gazette*'s "User Group Update" column, the club has obtained the addresses of other groups with similar interests. Members now correspond regularly with other Commodore owners in Europe, swapping public domain software and exchanging information.

In addition to playing games and using graphics packages, Vega uses his 128 to help run the hardware store he owns and his family's bookstore. He also translates programs into Spanish for his children's use.

Another member of the group, Juan Sepulveda, manages Radio America Latina, a local radio station. He likes to use graphics programs and flight simulators in his free time, but his 64 stays busy at work with *SwiftCalc* and GEOS. Sepulveda uses his computer to help design sales materials, brochures, and other business documents for the station.

Leo Castro, 12, is the club artist. He likes to draw pictures of spaceships, landscapes, flags, and record album covers on his computer. Castro uses *Micro Illustrator* for his computer creations.

Kogi Sugimura (left), president of the Commodore Fan Club of Osaka, with some members of the group. Mr. Takagi (third from left) helped develop Commodore's PET years ago.

Villahermosa, Mexico

A thousand miles north of Costa Rica is the city of Villahermosa, in southern Mexico. The 64 and 128 are popular computers in Tabasco, a state that borders the Gulf of Mexico, even though supplies are limited.

Esteban Quijano Bonfil is the president of a user group called Grupo Commodore del Sureste. As in any group, interests are varied. Bonfil says he programs in six computer languages and loves C. On the other hand, several young boys in the group think about nothing but playing games. Other members are interested in learning more about computers and electronics.

The group meets on the first Sunday of each month from 10 a.m. to 3 p.m. at a computer center in Villahermosa. Dues are 10,000 pesos (about $4.30) monthly, and the money is used to buy computer magazines and to communicate with other user groups, both in Mexico and abroad.

Commodore owners in this group buy a lot of software, most of it from the U.S. "The price in Mexico of a program?" says Bonfil. "Are you kidding? Is very expensive." Someone bought a copy of Accolade's *Test Drive* for $25 on a visit to the U.S. The program sells for $58 in Villahermosa.

U.S. brands are well-known in Mexico. If club members see anything from Epyx, they buy it, Bonfil says. *Impossible Mission* is the group's favorite game. MicroProse and Infocom titles are also popular contenders. There is very little software on the market from Mexican programmers, and what few titles appear are usually business programs.

Only one store in the state sells Commodore computers. Bonfil says the management prefers to sell PC clones. Service is another problem. A disk drive may take two months to be repaired through the country's authorized dealer. Some members have waited a year to have their computers serviced. Others have sent their equipment to the United States for repair, but Bonfil says that's also expensive. He wishes there were more Commodore dealers in Mexico; then perhaps service would improve and prices of software and hardware would come down.

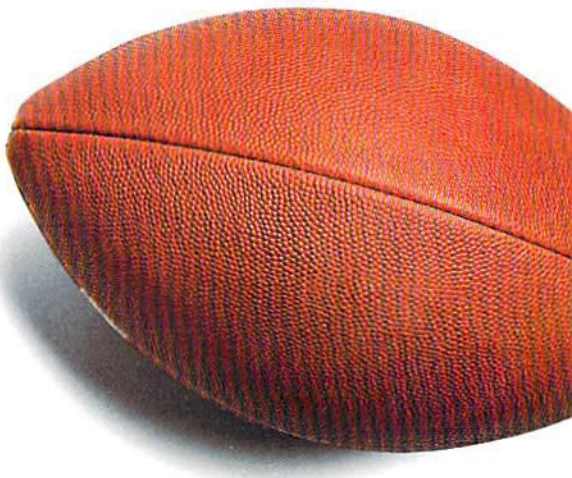
Modems are rare in southern Mexico. A few members have them and communicate among themselves, but there are no BBSs. Club members have read about bulletin boards, but long-distance telephone calls are too expensive to warrant their use. "Some friends that live in the U.S.A. tell me wonderful things about BBSs," Bonfil says. "They tell me that you get to know many people and learn very much. We want to play *Habitat* on QuantumLink."

Osaka, Japan

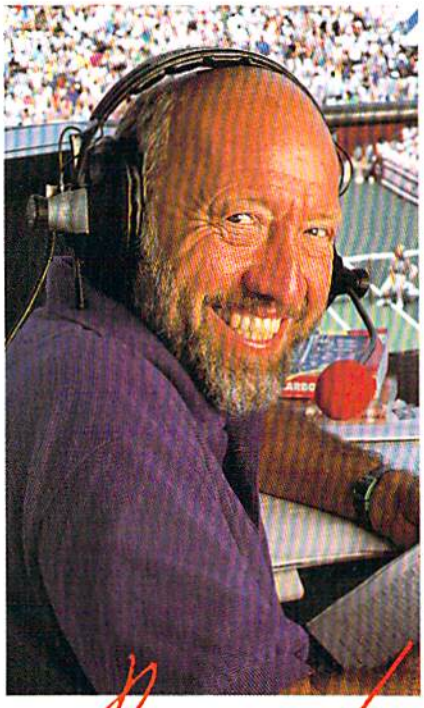
The Commodore Fan Club is a national organization in Japan with approximately 70 members. There are few Commodore user groups in Japan, despite the fact that until recently Commodore Japan Limited sold the PET and VIC-20. Now CJL exports semiconductors and component parts for disk drives and other computer equipment. At one time the VIC, 64, and Amiga were made in Japan, but the 64 is now made in the U.S. and the Amiga 500 and 2000 are made in Hong Kong.

Buying an imported computer, such as the 64 or 128, is more expensive than buying a Japanese brand. The NEC PC 9800 accounts for about 70 percent of the 16-bit-computer market in Japan and is very popular, according to Kogi Sugimura, president of the Commodore Fan Club of Osaka, Japan.

There are only two computer stores in Tokyo that sell Commodore computers. A 64 sells for approximately $300, and a 128 sells for about $550, according to ads in the Commodore Fan Club's quarterly newsletter, "Oh! Commodore." Software can be expensive. *Test Drive*, for example, is advertised by one Japanese dealer for approximately $70. Mail-order firms in the U.S. place advertisements in the group's newsletter, offering



ANNOUNCING ACCOLADE'S NEW SPORTS GAMES.



BUD COLLINS
Television tennis analyst

"What do I expect from a computer tennis game? Realism. I want to sense the power of a strong forehand, the ease of a smooth backhand. Accolade's Serve & Volley gives me that realism—and more.

"Serve & Volley truly captures the essence of the game—the action, the strategy, the pressure. You can select and place your shots via the animated "Strobe-O-Stroke" graphics. There's match or tournament play, three levels of difficulty, even three different court surfaces.

"Why should I leave the office to cover a tournament? Now I can play one on my computer with Serve & Volley."

HANK STRAM
Radio voice of NFL Monday Night Football

"I've seen some great moves on the football field but nothing compares to the moves you'll find on 4th & Inches computer football. This is real pro football action with 11 animated players per side. It's great! The ball's snapped and you have 22 guys running around the screen buttin' heads!

"But the best part about 4th & Inches? The control. I pick the starters. I control the key players on offense and defense. Heck, this is a head coach's dream come true! And the playbook? Fantastic. You get a pro style playbook with 20 plays and 11 different formations.

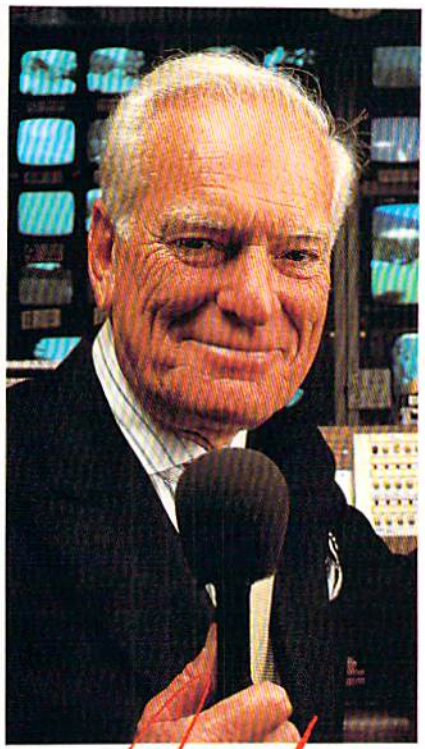
"Somebody at Accolade really knew their X's and O's when they drafted 4th & Inches. Great game plan, guys!"

MARV ALBERT
1988 Olympic boxing commentator

"I used to think my broadcast booth at ringside was the closest I'd ever come to the true boxing experience. Then I played T.K.O. computer boxing. Talk about "up close and personal!" T.K.O. put me right in the ring, face to face with a heavyweight champ.

"During a fight I like to do all the jawing. With T.K.O. I got to jab at a fighter's jaw. I threw a right… it landed! I could actually see those familiar signs of wear and tear on the champ's face. At the bell, the champ had a black eye, a fat lip and—I suspect—a bruised ego.

"It's a unanimous decision. Accolade's T.K.O. captures the feeling of boxing like no other game.



JACK WHITAKER
ABC golf announcer

"Jack Nicklaus is unquestionably the greatest golfer of his time and

I've been fortunate enough to follow his play on the greatest golf courses in the world.

"Jack Nicklaus' Greatest 18 Holes Of Major Championship Golf is the Golden Bear's personal selection of the most challenging holes in all of golf. Holes that have decided the four major championships.

"Accolade has come up with a simulation that not only recreates each hole with stunning accuracy—but it allows the player to golf against a computerized Jack Nicklaus. Quite an accomplishment.

"Jack never settles for second best. This is the computer golf game that others will be judged by for years to come."

CHICK HEARN
Voice of the Los Angeles Lakers

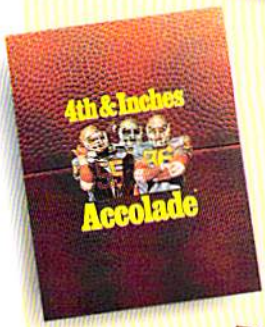
"To play championship basketball, you've got to have a great fast break. To play three-on-three, full court computer basketball you've got to have Accolade's Fast Break.

"No other computer basketball game gives you this much control and playability. You run the offense and defense. There are more plays, more players and more shots. And the thing that really impressed me was the network television court perspective. The animation was so fluid—I thought I was watching my monitor at The Forum!

"Take it from a guy who's

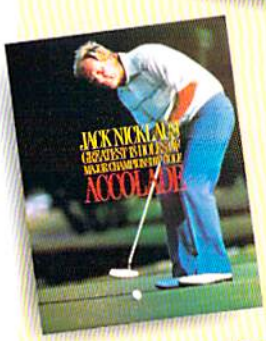
seen his share of great fast breaks—Accolade's Fast Break is a slam dunk."

Available on C64/128, IBM PC, Tandy & compatibles and Apple IIGS.



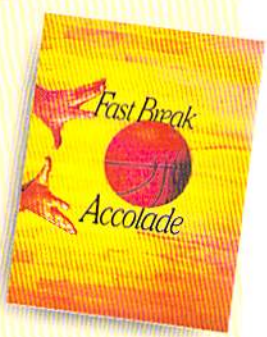
Available on C64/128, IBM PC, Tandy & compatibles, Amiga and Apple IIGS.

Available on C64/128, IBM PC, Tandy & compatibles.



Available on IBM PC, Tandy & compatibles, C64/128, Amiga and Apple IIGS.

Available on C64/128 and IBM PC, Tandy & compatibles.



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- ☐ Visit with and attend an NFL Monday Night Football game broadcast by Hank Stram.
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YOUR NAME (please print) _____

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NAME OF RETAIL OUTLET YOU SHOP FOR SOFTWARE _____

CITY & STATE OF THAT STORE LOCATION _____

Type of Computer Owned: ☐ IBM/Tandy & Compatibles ☐ Commodore 64/128
☐ Apple II Series ☐ Apple IIGS ☐ Other_____

Offer good only in U.S.A. Offer void wherever restricted or prohibited by law.

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How to Enter. Provide all the information called for on the official entry form (including your choice of Sports Fan Fantasy prize), or print this same information on a plain 3" x 5" piece of paper and mail your entry in time for receipt by March 31, 1989 to: Accolade Play-By-Play Sweepstakes, P.O. Box 914, Wilton, CT 06898-0914. Enter as often as you wish, but each entry must be sent in a separate envelope via First Class Mail.

Prize Awards. The five (5) different Sports Fan Fantasies listed on the entry form comprise this program's prize offering, each fantasy to include such transportation arrangements and other accommodations as may be necessary for two persons traveling together, including the sports event tickets. All arrangements shall be made by Accolade at its discretion as to announcer visit time and place and event selection. Applicable period for fan fantasy arrangements shall be 4/15-12/31/89. Each winner will be offered the option of receiving $1,500 cash instead of the fan fantasy prize for two.

Winner Drawings. One winner will be chosen for each of the five different Sports Fan Fantasy prizes by means of a series of random drawings to be conducted on 4/1/89 by AMA, Ltd., an independent judging organization whose decisions are final. Prize winners will be notified by mail by 4/8/89. Odds of winning the Sports Fantasy indicated as an individual entrant's choice depend on the number of entries received indicating that same event choice. Winners will be required to provide social security number and to sign an affidavit of eligibility and publicity/travel release. Tax liability on prize winnings is responsibility of each winner. Prizes are not transferable, although any prize won by a minor will be awarded in the name of a parent or legal guardian.

Eligibility. Sweepstakes open to all U.S. residents except employees of Accolade, Inc., its marketing agencies, this program's suppliers, and their immediate families. Void wherever prohibited or restricted by law. To request a list of the prize winners, send a stamped, self-addressed envelope before 4/1/89 to: Accolade Play-By-Play Winners, P.O. Box 7180, Wilton, CT 06897-7180.

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software at more reasonable prices, even with the additional postage.

CFC members in Osaka meet every Saturday at System Applications Lab. The lab's director, Mr. Takagi, worked at Commodore for about ten years and helped develop the PET. Several times a year the group meets in Tokyo with members of the Tokyo International Commodore Users Group, whose membership is comprised mainly of foreigners residing in Japan.

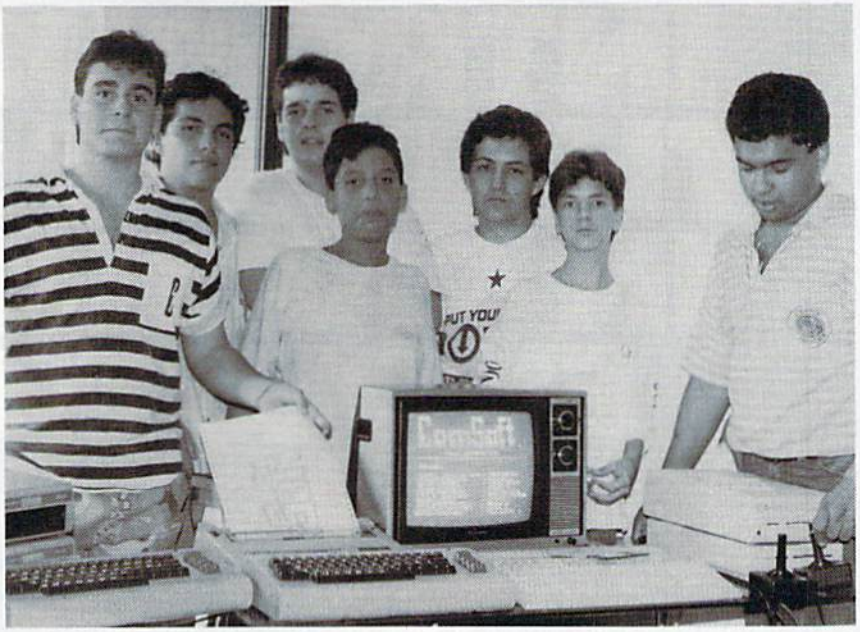
Bulletin boards in Japan operate using the Chinese characters, *Kata-Kana* and *Hira-Kana*, that the Japanese use to write their language. For this reason, the 64 and 128 are not popular machines for Japanese BBSs. Commodore users do have a forum on the J & P Hotline, a BBS sponsored by a large computer-store chain. The Macintosh is popular in Japan since it supports Chinese characters. Sugimura says he would like to see Commodore do the same so he could have a Japanese word processor for his computer.

QuantumLink's reputation among 64 and 128 owners has also reached Japan. Sugimura says he and other CFC members would like to access QuantumLink and take advantage of its many features—but without making a trans-Pacific telephone call.

Bangalore, India

About three years ago a manufacturing company called Commander Computers imported machinery and other equipment, planning to build Commodore computers in India. Production has yet to begin, although the firm has assembled some 64s and 1541 disk drives, according to S. Ram Gopal, a member of the Commodore Users Group in Bangalore, India.

While waiting for a local supplier, most Commodore users in this city in southern India import their equipment from the U.S. or Britain. Owners have compatibility problems with U.S. equipment, however, because of the color and voltage differences. India uses 220 volts and the PAL color system, whereas the U.S. uses 110 volts and the NTSC system. These problems do not deter the dedicated 64 and 128 users in Bangalore. They use a step-down transformer to convert 220 volts to 110 and buy a JVC television model that offers numerous video standards.



Members of ComSoft, a user group in Colombia, started the first Commodore BBS in their hometown of Cali.

There are about 70 members in the user group, which meets on the first Saturday of each month in a hotel, a school, or the home of a member. As in any group, members show varying degrees of enthusiasm. "We have divided them into active and sleeping members," Gopal says. "There are about 30 active members who attend meetings and keep in touch with the group. And you know who are the sleeping ones."

Most club members own 64s, two have 128s, and one member uses a VIC-20. As in most groups, the people in Bangalore use their computers for entertainment, personal records, family accounts, and education. "One of our members has been successfully using the 64 for educating his handicapped child," Gopal explains. Those who use the 64 or 128 in business tend to be professional people or owners of a small business: doctors, tax consultants, real estate agents, and accountants.

Superbase, GhostBusters, Exploding Fist, Raid over Moscow, and GEOS are very popular, as are *Gazette*'s *SpeedScript* and *COMPUTE!*'s *SpeedCalc*. No one in the group has a modem, and BBSs are still in the future.

India has seen very little in the way of local programming. Whatever has been developed is mainly in BASIC for the programmer's own use. "Software is not sold in India," Gopal says, "and we have to depend on outside sources."

In addition to *COMPUTE!'s Gazette,* members subscribe to several British publications, such as *Commodore User, Your Commodore,* and *Zapp 64*. Members also correspond with user groups in the U.S. and Saudi Arabia. They would like to increase their international contacts. "We look forward to receiving more mail from other users," Gopal says.

Stockholm, Sweden

Computer Club Sweden started about five years ago as a forum for all computer users. The club is now an umbrella organization that provides financial support and helps with the paperwork of its various chapters.

CCS has four local chapters in the Stockholm area, the Stockholm Computer Club being the largest. Total CCS membership is about 5000. Owners of all computer brands are eligible to join, but the 64 is represented more than any other machine, according to club secretary Barbara Berg.

As a result of the club's diversity, one person is selected for each major brand to be responsible for guidance within that area. This is the person members turn to for help.

CCS publishes a monthly mag-

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David Martin, RUN Dec '87

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Art Hunkins, Gazette June '88

"...my personal favorite is Super Snapshot."
Morton Kevelson, RUN Sept '88

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John Christensen, Input

"The monitor that made me give up all the others."
Lawrence Hiler, Chip Level Designs (formerly of Basement Boys Software)

"...indispensable, can't live without it."
Bob Mills, programmer of Renegade

...and now we bring you
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With even MORE of the power-packed utilities you've come to expect from the makers of the most popular utility cartridge in North America!
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"Slideshow and Snapshot are a power partnership."
Sue Albert, INFO May/June '88

"...a gem of a companion: Slideshow Creator... well-designed..."
Art Hunkins, Compute!'s Gazette June '88

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LMS TECHNOLOGIES

azine filled with computer news and tips and information about the various chapters. Funded by advertisements, the magazine has a professional appearance.

The Stockholm Computer Club holds weekly meetings on Sundays, usually in a school, and is active in autumn, winter, and spring. "In the summer, most Swedes spend that time at their respective summer places," Berg says, "and computer activities are less dominant."

Representatives of various companies are invited to demonstrate computer products at the meetings. Other topics range from music to genealogy. Swap meets and computer courses are also popular.

The CCS supports two bulletin board systems. As with most boards, the downloading of public domain software is the most active feature on both services. Application programs, such as spreadsheets, bookkeeping, and terminal programs, are the BBS "best sellers," according to Berg. Music programs are also in demand.

There is a wide variety of commercial software for the 64 and 128, but it is expensive. A program costs about twice as much in Sweden as it does in the U.S. Software is readily available in computer stores and in a toy and hobby chain called Big and Little. The 64 is used extensively in Stockholm schools, and math and language programs are abundant, even in Swedish. "In my own work as a teacher," Berg says, "I have found the 64 invaluable."

Think your user group is big? Computer Club Sweden has 5,000 members.

If you'd like to correspond with any of these user groups, write to them at the addresses below. Be sure to use the appropriate postage for the country to which you're writing.

ComSoft Commodore User Group
D.F. Cardenas
Apartado Aero 9872
Cali, Colombia

Club Commodore de Tibas
Marvin Vega
P.O. Box 516
Tibas, San Jose, Costa Rica

Grupo Commodore del Sureste
Barcazas #115
86100 Villahermosa
Tabasco, Mexico

Commodore User Group
S. Ram Gopal
1012, 19th D Main Rd.
Rajajinagar, 1st Block
Bangalore 560 010
India

Commodore Fan Club
Kogi Sugimura
2-1-10-1107
Higashi-Taishi
Yao Osaka
581 Japan

Computer Club Sweden
Hans Engstrom
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1541 Repair	79.95	Monitors	CALL
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Caroline D. Hanlon

Writer? Editor? Artist? Designer? With your 64 or 128 and the right software, you can be all of these. In fact, you can be a bona fide publisher. Here's an up-to-date list of the tools you can use to start your own press.

Desktop Publishing Packages

BetterWorking Word Publisher
Spinnaker
GEOS
$39.95

Word Publisher works in the GEOS environment and is compatible with *geoPaint* and *geoFont*. It supports nine fonts and six type styles per page. Editing features include center, right, and full justification; single- and double-spacing; tabs; headers; footers; pagination; and word-wrap; and the commands can be accessed by mouse. In the view mode the documents can be displayed as WYSIWYG. Files can be chained for longer documents, and multiple graphics can be placed on the same line. The program contains a 100,000-word spelling checker and supports more than 100 printers.

geoPublish
Berkeley Softworks
GEOS
$49.95

A full-featured desktop publishing program, *geoPublish* features a complete graphics-oriented draw program; headline, columns, and graphics region layout; graphics options; the ability to import graphics from *geoPaint;* support for over 70 dot-matrix printers and all PostScript laser printers. The program can create documents up to 16 pages long; it has full-page and zoom display modes, supports over 80 GEOS-compatible fonts in point sizes ranging from 4 to 192, and can wrap text around graphics. The document text flows from page to page.

The Newsroom
Springboard
$49.95

Desktop publishers can use this program to create newsletters for family, clubs, school, or business. *The Newsroom* contains a word processor and over 600 pieces of clip art. Text wraps around any photos and graphics added to the composition. There are five fonts to use for entering text, and text can be printed out on most printers.

PaperClip Publisher
Electronic Arts
$49.95

PaperClip Publisher users can produce multiple-column page layouts for items including newsletters, fliers, price lists, menus, greeting cards, résumés, and brochures. The program supports various-sized documents of up to 50 pages. Other features include the ability to work outside a given document for temporarily holding text and graphics; a refreshing feature that automatically updates any altered part of a document; the ability to move articles page to page; and WYSIWYG display.

Personal Newsletter
Softsync
GEOS
$49.95

Designed for use with GEOS, *Personal Newsletter* includes two disks. The first, titled The Master, contains the program itself as well as sample newsletters and 70 pieces of clip art. The second disk, Clip Art, holds 200 pieces of art. Features of the program include an 80-column work screen, document preview, and up to 20 windows (for text and graphics) per single page. *Personal Newsletter* accepts clip art from *The Print Shop* and digitized art, and it includes three utility programs that can be used to import and customize existing graphics.

Specialty Packages

Award Maker Plus
Baudville
$39.95
Parents, teachers, coaches, and best friends can use this program to create a variety of customized awards, certificates, licenses, coupons, and other documents. Designers can choose the text style, personal message, border style and color, and hi-res pictures to add to hundreds of predesigned awards. The program supports class name files and includes gold-embossed press-on seals.

AwardWare
Hi Tech Expressions
$14.95
Users can print traditional certificates, awards, licenses, signs, and announcements and create coupons, tickets, checks, stationery, memos, and other awards. There are 20 graphics, 20 borders, five fonts, five seals, and unlimited text borders from which to choose. The Commodore version also includes a version of the program for Atari computers on the flip side.

CardWare
Hi Tech Expressions
$9.95
People of all ages can print greeting cards for birthdays and special occasions. The cards can be personalized with name and age, and a variety of graphics and musical effects can be added. Graphics include a teddy bear, a rag doll, roses, a birthday cake, a toy train, and a village scene. Cards and greetings can be printed or sent on disk.

Certificate Maker
Springboard
$39.95
Personalized certificates can be created for all kinds of occasions at school, home, or work. There are over 200 certificates to choose from, and individual names and messages can be added to each. More than three dozen gold seals and stickers are also included to give the certificates some extra charm.

Create a Calendar
Epyx
$29.95
Daily, weekly, monthly, and annual calendars can be designed with this program. Over 100 graphics, borders, and fonts are included, or images from *Epyx Graphics Scrapbooks* and *The Print Shop* can be imported. Notes and graphics can be added to any day, and regular events can be scheduled automatically. Users can call up any year from 1753 through 9999.

PartyWare *from Hi Tech Expressions*

HeartWare
Hi Tech Expressions
$9.95
With this program, users can print greeting cards of friendship, love, and appreciation. Graphics include flowers, a rainbow, a butterfly, and more. The animation can be personalized with friendship greetings. The Commodore version also includes a version of the program for Atari computers on the flip side.

JingleDisk
Hi Tech Expressions
$4.99
This holiday card maker can help users print full-page graphics or folded cards for personalized season's greetings. Animated, musical stories can be added to each message. The program includes the disk-kaer option.

Love Note Maker
Hi Tech Expressions
$14.99
Love Note Maker contains 100 sheets of heart printer paper, 16 stickers, and a program for creating personalized love notes and animated friendship greetings. Graphics include birds in a nest, snails, love fish, nature scenes, a pond with a rainbow, a large heart with an arrow, and an underwater scene.

PartyWare
Hi Tech Expressions
$14.95
Users can print invitations, thank-you notes, and greeting cards for parties and other special occasions, or design their own party decorations. Other creations include banners, hats, place mats, animated cards, invitations, and greetings on computer disks. The program contains a variety of graphics, greetings, and borders. Print utilities can generate 15 graphics, 15 graphic salutations, and ten borders. The program also has a database that can hold 60 names and addresses. The Commodore version includes a version of the program for Atari computers on the flip side.

PrintMaster Plus
Unison World
$34.95
This graphics program allows users to design and create banners, posters, stationery, cards, and calendars with their computer and a dot-matrix or laser printer. The program offers 11 borders, nine fonts, a drawing pad, a graphics editor, and over 100 pieces of art. Users can place the border and text, preview it, change it, add graphics, and preview it again before printing. Previously saved designs can also be edited. Additional graphics disks are available from Unison World. ▷

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- DISK LOOK – Sort directory. Recover lost files. Display file start/end addresses. Disassemble any file program directly from the disk to SCREEN or PRINTER including undocumented opcodes. Edit Ram. Much, much more.
- FILE COMPACTOR – Can compact machine programs by up to 50%. Saves disk space. Compacted programs run as normal.
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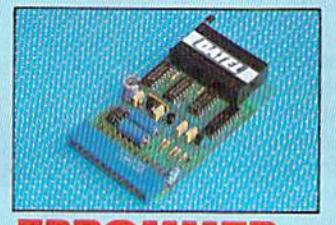

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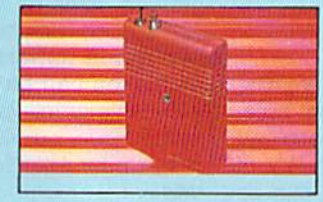

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- Because of Action Replay's on Board Ram the Frozen program can be looked at in it's ENTIRETY. – In it's Frozen state. That means Video Ram, Zero Page etc. and remember you see the code in it's Frozen state not in a Reset state as with competitors products.
- Restart the program at any point.
- No corruption.
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- Compactor: Efficient compacting techniques – 2 programs per disk side – 4 programs if you use both sides.
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Cards, flyers, stationery, and signs can be created and printed using *The Print Shop*. There's an assortment of pictures, symbols, borders, backgrounds, and type fonts and sizes to select, and the graphics and text editors allow the user to make simple changes. The program prints to most Commodore-compatible printers and accepts keyboard, joystick, or Koalapad input. The package includes color paper and envelopes.

Sesame Street Print Kit
Hi Tech Expressions
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The Muppets are featured in this print program for the entire family. It can be used to design and print signs, posters, banners, cards, invitations, decorations, and books. Sixty Sesame Street Muppet graphics are included, along with 20 borders and seven typefaces. The program is available on a flippy disk for the IBM and Apple II or Atari and Commodore 64.

Graphics Support

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PrintMaster Plus, The Print Shop
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Designed for use with *PrintMaster Plus* and other packages, this program contains over 300 graphics of major events and people in American history. Every state and president is depicted.

Art Gallery: Fantasy
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PrintMaster Plus, The Print Shop
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A collection of 140 fantasy graphics, this program includes Amazons, dragons, trolls, treasures, and weapons. The program can be used with other desktop publishing packages, also.

Art Gallery I
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PrintMaster Plus, The Print Shop
$24.95
Over 140 graphics to use with desktop publishing programs are contained in this program. Themes include signs of the zodiac, major holidays, animals, office items, sports, and background patterns.

Art Gallery II
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This supplemental program for *PrintMaster Plus* features graphic designs including international flags and symbols, ornamental letters, people, pets, and business art.

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This program offers over 100 additional certificates to use with the *Certificate Maker*. There are 24 new borders and six dozen stickers.

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Clip Art Collection, Volume 2
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This collection of clip art to use with *The Newsroom* features medical, day-care, realty, industry, office, shopping, travel, and other business-related graphics. Over 800 pieces of clip art are included.

Clip Art Collection, Volume 3
Springboard
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$29.95
This selection of clip art for *The Newsroom* offers over 600 sports and recreation pieces, including tennis, skydiving, baseball, fishing, soccer, track, and camping.

Graphics Expander, Volume 1
Springboard
The Print Shop
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The *Expander* includes over 300 graphics that can be used with *The Print Shop* to create banners, letterheads, cards, and signs. The program offers drawing and editing tools to let the user change the graphics or design new, original ones. Text can be added to the artwork, and hi-res pictures from other programs can be modified to use with *The Print Shop*.

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Electronic Arts
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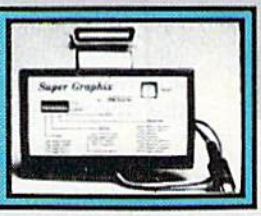

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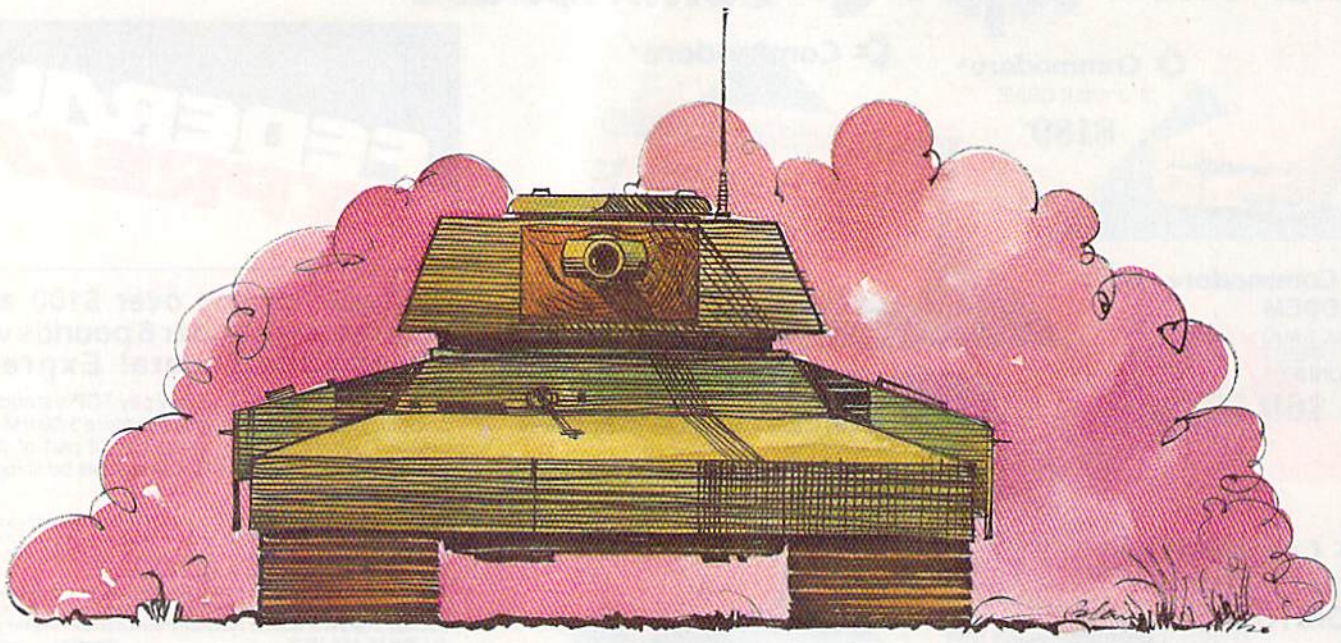


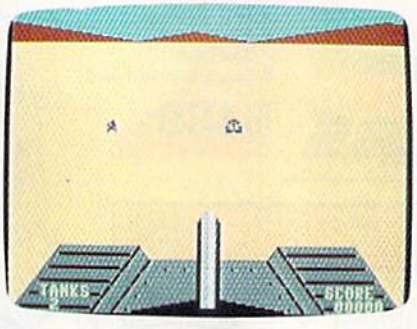
Tank Ambush

Anthony Bertram

Battle an onslaught of enemy vehicles in this graphically excellent arcade-style shoot-'em-up for the 64. Joystick required.

"Dear Mom and Dad: I'm stuck in the desert. Out of gas. Enemy tanks in front. Jeeps behind. Closing in all around, in fact. This is my last letter to you. Say goodbye to Fido for me. You're right, Mom; I should have been a surgeon."

You've said your goodbyes. Now it's time to take some of the enemy with you. "Tank Ambush" is a demanding action game that drops you into a tank that's short of fuel but loaded with ammunition. You can swivel a full 360 degrees and raise and lower your gun to hit the oncoming vehicles.



Use your heavy artillery to take out the enemy in "Tank Ambush," an arcade-action game.

Getting Started

Tank Ambush is written in machine language. Type it in with "MLX," the machine language entry program located elsewhere in this issue. The MLX prompts, and the values you should type in, are as follows:

Starting address: 0801
Ending address: 1500

When you've finished typing the data for Tank Ambush, save the program to tape or disk before exiting MLX. Although the program is written in machine language, you can load and run it as if it were written in BASIC.

To play, plug a joystick into port 2 and then load and run Tank Ambush. You'll be asked to select among three levels of difficulty. Choose the level by pushing the joystick forward or pulling it back. Press the fire button to begin the game.

You're sitting in a tank. On the horizon you'll see the enemy approach. Raise your gun by pushing the joystick forward; lower it by pulling back. The elevation of the gun controls how far you shoot. Remember that the enemy is pressing in from all sides. Swivel the gun turret by pressing left or right on the joystick.

Pick off enemy soldiers one by one as they approach. If one gets close enough, you'll see his ammo exploding in front of your tank. You are almost constantly in grave danger—swivel to find the closest soldier and do him in before he does you.

You have three lives. Your goal is to rack up as many points as you can before the final exchange of fire.

To pause the game, press SHIFT or SHIFT-LOCK.

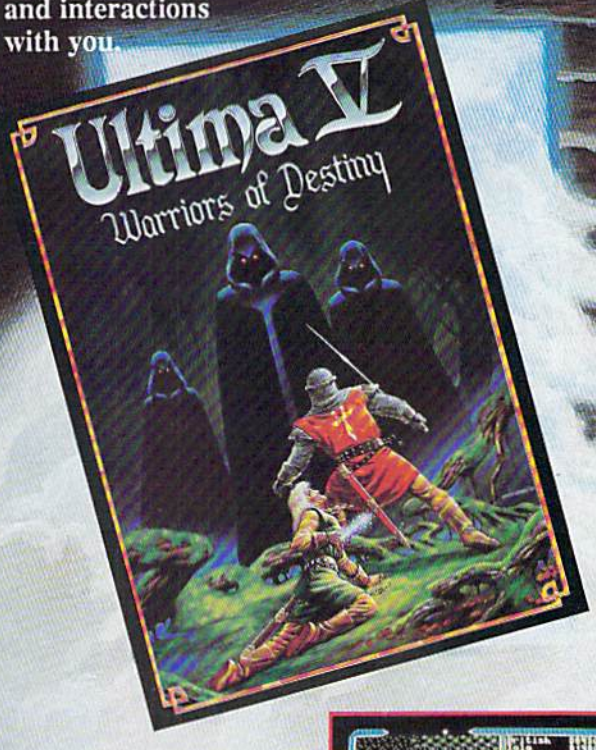
See program listing on page 80.

The wait is over... but the excitement has just begun.

More than two years in the making, Warriors of Destiny sets the new standard for role-playing games. No other game can offer you as beautifully detailed a world or as exciting an adventure. Ultima V is the game for all role-playing gamers: Warriors of Destiny will enchant the novice and challenge the expert.

Highlights of Ultima V

- Powerful new combat and magic systems, increasing in sophistication as your skill increases.
- Over twice the graphic detail, animation and sound effects of earlier games.
- Hundreds of truly life-like people who can carry on complex conversations and interactions with you.



Screen displays shown from the Apple™. Others may vary. Allows the use of Ultima IV characters. No previous Ultima experience required.

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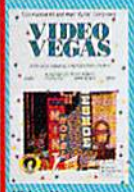

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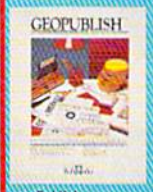

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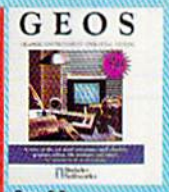

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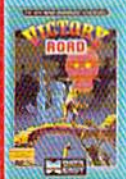

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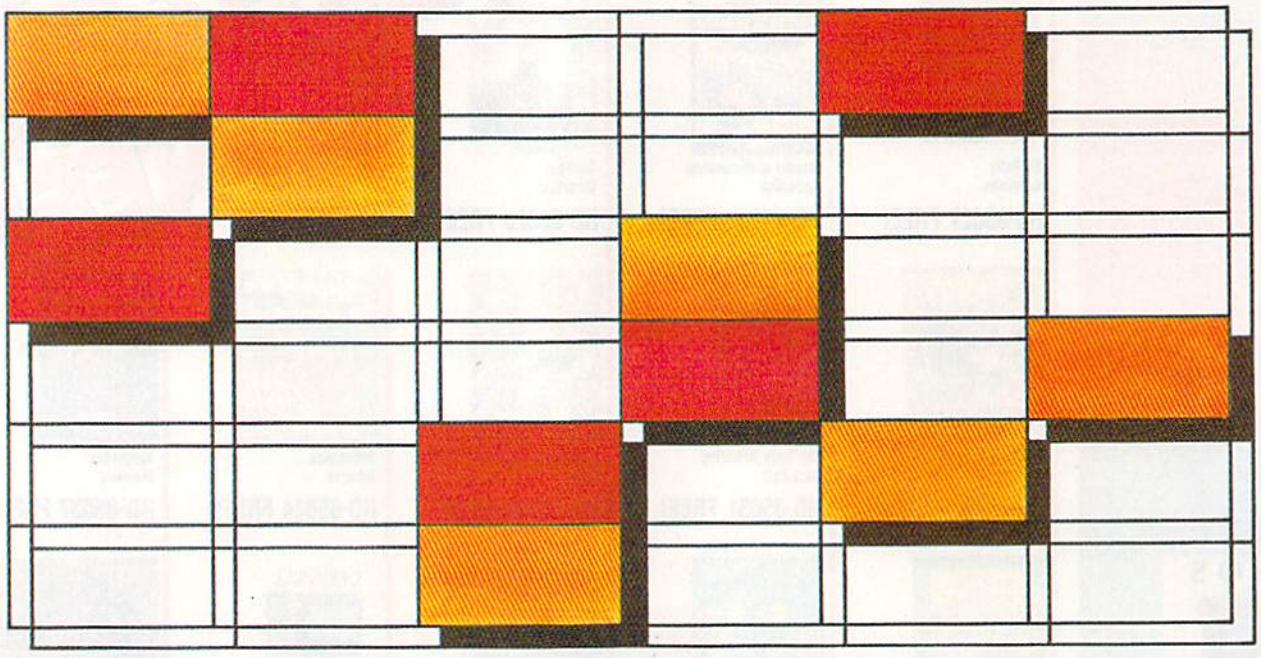


Gridloc

Dan Stephens

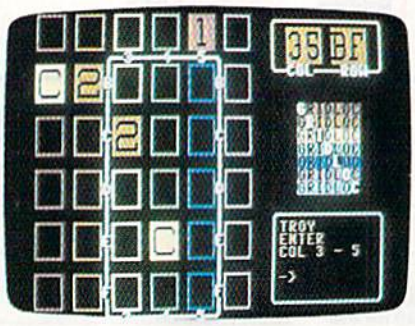
Be the first to "lock" the grid in this colorful strategy game for the 128.

"Gridloc" is a game of strategy and luck. To win, you must occupy a square in each row and column of the game's 6 × 6 playfield before your computer opponent does. To make things more challenging, Gridloc allows up to four additional human or computer opponents.

Getting Started

Gridloc is written entirely in BASIC. To prevent typing errors, use "The Automatic Proofreader" to enter the program. When you've finished typing, save a copy to disk.

To play Gridloc, simply load and run the program from 40-column mode on the 128. The program asks for the number of players. Enter a number 1–5. If you enter 1, you'll play a game of one-on-one with the computer (there's always one computer player). Next, enter the name of each player. To add more computer players, enter COMPUTER as the player's name. If you enter COMPUTER for each player's name, the computer will play Gridloc against itself.



Outwit your opponents in this colorful strategy game.

Gridloc's playing area consists of a 6 × 6 grid of colored cells. Two windows appear to the right of the grid. The bottom one is the command window, where you enter your commands. The top window displays the game's *movement dice*. The movement dice are rolled before each player's turn. They determine your legal moves (you can't move just *anywhere*). The computer outlines the area into which you can move.

To make a move, enter the column (1–6) and row (A–F) of the square you wish to occupy. You can move to any square within the selection area, even on top of another player's piece. In fact, by landing on your opponent's piece, you remove it, which is an excellent strategy—the computer won't hesitate to oust your pieces. You can tell to whom a piece belongs by its color and its number or letter. Pieces displaying a large 1 belong to player 1, while pieces containing a large C belong to the built-in computer player.

The game ends when one of the players occupies a square in each row and column of the 6 × 6 grid. The pieces do not have to be aligned as in tic-tac-toe. When the game ends, the winner is treated to a short victory song; then the computer asks if you wish to play again. Answer by pressing Y for yes or N for no.

See program listing on page 81.

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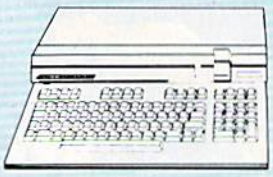

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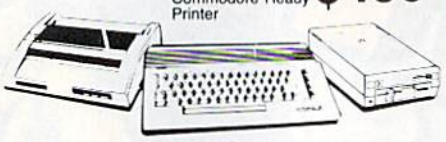

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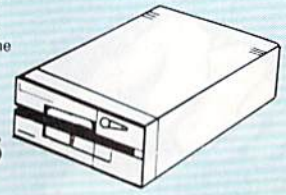

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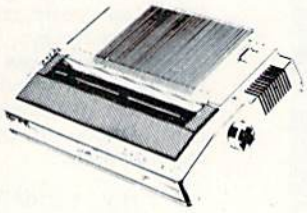

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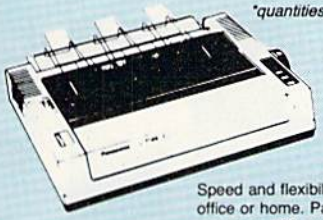

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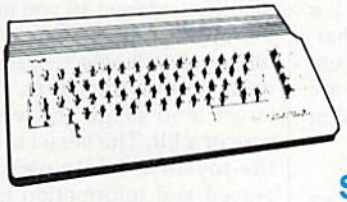

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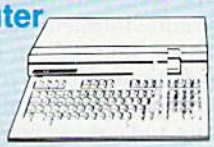

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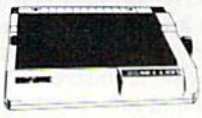

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Ocean Ranger

Scanning the instruments, you verify the Ocean Ranger's vital signs: speed, 34 knots; bearing, 075 degrees; radar, clear; weapons systems, all operational; Sea Sparrow and Harpoon missiles, 76mm cannon shells, and depth charges, supplies ample.

The Ocean Ranger, one of the most sophisticated fighting ships ever built, is battle ready. You watch the horizon rise and fall over the bow as you recall the briefing that warned of enemy submarines and Soviet-made MiGs.

As if triggered by the thought, a warning buzzer sounds. Press a key and TADS identifies a target: submarine off the port bow. Click another key to select a depth charge. The computer has located the sub and is tracking its course. Wait for the sub to get within range . . . wait. . . .

Fire!

Instantly TADS switches to a second sub. Wait . . . wait. . . .

Another warning buzzer! A trio of incoming MiGs.

Fire depth charge!

Select Sea Sparrow—launch!

The buzzer still blares as the first MiG explodes. The computer is already tracking the second MiG and indicates it is too close for the Sea Sparrow. Switch to 76mm cannon.

Open fire!

The staccato of the cannon hasn't silenced the buzzer. Two more MiGs approaching from starboard this time and several enemy warships to port.

A trap!

The horizon tilts as you call for a hard turn to starboard and increase speed to 45 knots. Spray envelopes the bridge. Select a Harpoon missile to attack the nearest ship.

Fire!

MiGs swarming like killer bees . . . warning buzzer . . . target on the threatboard!

Fire!

Another alarm sounds in the background, but your mind puzzles over this unfamiliar ring.

"Honey, it's for you!"

You sigh and issue another order before reaching for the telephone. The computer screen flashes: "The war is on hold, sir!"

The Ocean Ranger is "a frigate-sized foilborne missile ship . . . capable of simultaneously tracking, engaging, and destroying numerous dissimilar targets," according to the manual. What it doesn't say is that this is one of the easiest-to-learn, most realistic, enthralling simulations afloat.

Any simulation that can be taken on a maiden voyage with only verbal directions from a seasoned player is already a league ahead of any competitor, in our estimation. It was this that caused Robin, who had never played a simulation before, to take command one evening.

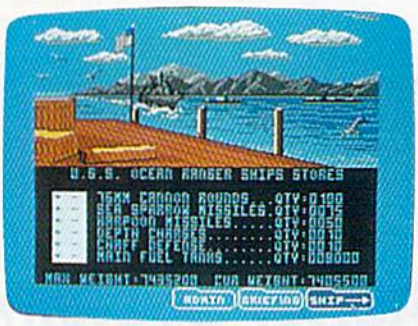
Not that *Ocean Ranger* is easy. Far from it. Its 16 levels of play offer challenges ranging from comfortably secure to sweaty-palmed frantic. (There are reasons why some captains are killed in action and still others are POWs!)

One of the easiest-to-learn, most realistic, enthralling simulations afloat.

Your adventure begins with a trip to Administration to set up your Personnel File. Select your level of service and theater of action, two factors that determine difficulty. There are four choices for each, ranging from basic training to covert action in such diverse military theaters as the Bering Sea and the Persian Gulf. This is where you also learn how to earn various medals and decorations.

The next stop is your top-secret briefing where you view a slide presentation and receive primary and secondary missions and a home base. Next, proceed to the ship's stores to outfit your vessel with offensive and defensive weapons and fuel. Finally, you are piped aboard ship to take the bridge.

From the bridge you command views fore and aft, starboard and port. Charts and displays are at your fingertips to keep you informed of such things as current coordinate location, weapon readiness, fuel consumption, and so on.



Of prime importance is TADS, the ship's Target Acquisition and Designation System, or target identifier. This identifies a target so you may decide on the appropriate action. When the correct weapon is selected, sights automatically lock on the target. Fire when the target is in range and you are almost sure of a hit. The vessel is controlled by the joystick, while weapons are deployed and information is recalled via the keyboard.

Now you are ready to weigh anchor and set out on your mission. You may be shot at by MiGs, be fired upon by enemy vessels, encounter treacherous submarines, be forced to thread your way through mine-infested waters, or any combination thereof. As in any war, your mission is to destroy your target and return to port with as little damage to your ship and crew as possible. If there is damage, you may have to anchor and spend time on repairs.

Upon arrival in home port, report for a debriefing. If your mission was successful, you may receive a medal or even a laudatory reception from family and friends. Any commendation or recognition of service is appended to your personnel record. You begin your command as a Lieutenant with an ultimate goal of making Admiral within 20 years of service.

It's hard to isolate features of this program for enumeration. *Ocean Ranger* is good on every count: top-notch graphics, digitized voice effects, realistic battle effects, and some absolutely terrific details. The movement of the horizon, MiGs, changing sky color, engine noise, static screens, and animated graphics are all outstanding.

This is not a sharpshooter's game; TADS takes care of that. It is more a strategist's game—deploying the right

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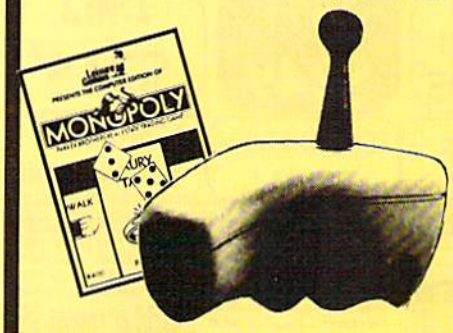

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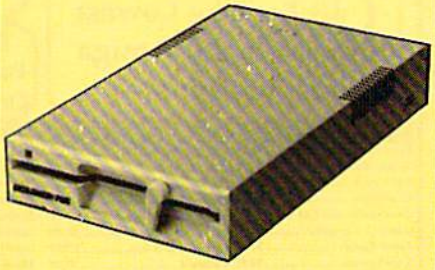

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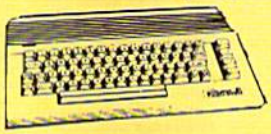

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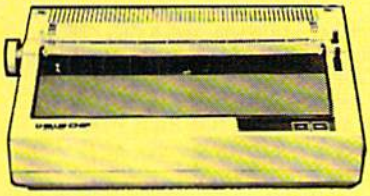

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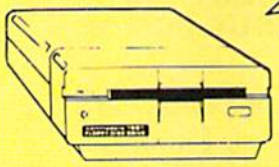

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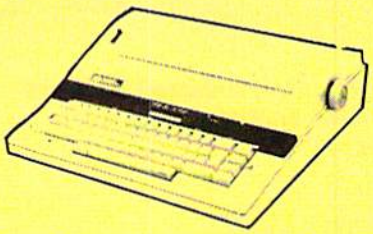

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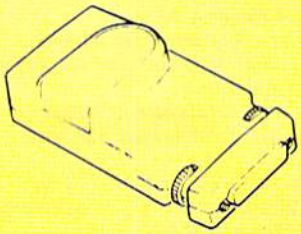

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1986

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April—Turbo Copy, CP/M on the 128, Directory Filer, 128 Windows, Input Windows
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July—Saloon Shootout, Budget Planner, Math Worksheet, Sound Designer 128, CP/M Public Domain Software
August—Address Cataloger, TurboDisk 64, TurboDisk 128, Boldface Print, 128 Sprite Rotator
September—Ultrafont +, Video Jigsaw, Window Wizard, Fast File Copier, 80-Column Character Editor, DOS Window
October—Pig$ for Buck$, Ringside Karate, Menu System, 128 Sound & Music (Pt. 1)
November—Fill-64, 128 Keywords, 1526 Underliner, Turbo Format, 128 Sound & Music (Pt. 2)
December—Q-Bird, Moon Rescue, The Animals' Show (128), Sprite Locater, Bar Charter, 128 Quicksort, 128 Sound & Music (Pt. 3)

1987

January—Keyword Construction Set, One-Touch Function Key, GEOS Icon Changer, CP/M: Surviving with 40 Columns
February—Collision Course, Division Worksheet, MetaBASIC 64, MetaBASIC 128, 128 DOS Wedge, 128 Sound & Music (Pt. 4)
March—Ringside Boxing, Color Craft, 128 RAM Expansion, CP/M RAM Expansion, Sprite Manager
April—Omicron, Music Improvisor, *Print Shop* to GEOS, TurboSave 128, TurboSave 64, Countdown Timer
May—*SpeedScript* 3.0, Powerball, Cassette Sleeve Maker, No-SYS Loader, Fast Boot, Gameports
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July—Basketball Sam & Ed, Calendar Maker, Crash Prevention, 128 Graph Designer, GEOS File Storage, Text Framer
August—Bounty Hunter, Sprite Magic, Sprite Stamp, 80-Column Sector Editor (128), Relative Files
September—Sub Attack, Exercise Pacer, Screen Maker, Impossible Scroll, Video Slide Show, 80-Column Magic
October—*SpeedScript 128*, Chopper Pilot, Stars: A Simulation of the Heavens, Directory Magic, Font Printer, Animator 64
November—Litterbug, Sketch Pad, Poster Printer, Renumber 64, Accessing the 128's 80-Column Screen
December—Crossroads, Snake Pit, Word Find, Animal Match, Disk Rapid Transit, PrintScreen, GeoTrash Restorer

1988

January—How to Buy a Modem, Buyer's Guide to Modems, Needlework Graphics Editor, Tile Paint, Sound Manager
February—Buyer's Guide to Graphics Programs, Easy Load, Turbo *SpeedScript*, Fast 64 Mode for the 128
March—CP/M Software for the 128 (Pt. 1), XPressCard 128, ML Cloner, Big Screen, Color Lister
April—CP/M Software for the 128 (Pt. 2), 3-D Speedway, SpeedFile 64, Ramdisk 128, Mirrors
May—Networking the 64, Guide to User Groups (Pt. 1), Treasure Diver, MOBMaker, 128 Math Graphics, 1541 Speed & Alignment Tester
June—Buyer's Guide to Printers, Guide to User Groups (Pt. 2), Arcade Volleyball, Excelfont-80 (128), Graphics Wedge
July—Hard Disk Drives for the 64/128, Civil War on Disk, Quick Save, Error Analyzer, SYS Stamper
August—MIDI Made Simple, Buyer's Guide to Music Software, Cribbage (128), 128 Shell Booter, 3-D Sprites, Zoom
September—Write All About It! (desktop publishing), Pattern Fill, Multicolor Graphics Dump, SpeedCheck 128, Disk Package, MultiSort 128
October—Commodore Goes Back to School, Buyer's Guide to Preschool Software, Scorpion II, 64 Compressor, SpeedPrint, Speed Columns, 128 Text Sorter
November—GEOS 2.0: A Major Upgrade, Buyer's Guide to Word Processors and Spelling Checkers, Rally Racer, Block Out (128), Sprite Killer, Notepad 64, Font Grabber (GEOS)
December—88's Best Games, Ringside LXIV!, Crossroads II, Digi-Sound, Dynamic Windows, Quick! (1541 speedup), 1526 PrintScreen, Key Lock

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Now comes *Sporting News Baseball*, Epyx's second effort at the perfect blend of arcade and statistics games. Sanctioned by Major League Baseball, *The Sporting News*, and the New York Mets all-star catcher Gary Carter, this game promises much. The good news is that it does everything it was designed to do. The bad news, however, is that it should have been designed to do a little more.

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The game uses a limited number of statistics. Pitchers are given a batting average and an earned run average. Fielders have a batting average and a fielding percentage. These are the most important stats available for baseball players, but others would be useful, especially for drafting teams and trading players.

After selecting a team, a starting

pitcher, and a batting lineup (or having the computer do these for you), the home team takes the field and the game begins. The pitching screen is one of *Sporting News Baseball*'s greatest strengths. A large window in the lower middle of the screen shows the field from the catcher's viewpoint: The pitcher is on the mound, and the batter stands in the appropriate batting box. To the left of this screen, balls, strikes, and outs are clearly shown. To the right, boxes show the batter's name and average, the pitcher and his ERA stats, and—a very useful touch—the number of pitches the pitcher has thrown. The on-deck batter is not shown.

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second, and first base. When runners are on base, their moves are instantly visible in these screens. The intent of the screen design is to give the players a view of the important playing areas, without sacrificing pitching detail by showing the whole field as one graphic. It's a strong idea, and for the most part it works well.

After the pitcher chooses a pitch, the batter takes a practice swing. The pitcher throws, the ball approaches the plate, and the batter pushes the joystick's fire button to swing. Swing high, low, inside, or outside, depending on how you direct the joystick. Take the pitch, if you think it's a ball.

The batting game has some very good features. Steals are controlled by the joystick and fire button, and individual base runners may be controlled separately. Bunting is also controlled by the joystick. There's even a command to have the batter bunt while the lead runner steals. Also included is a fake, to make a human opponent think you have a play on.

The pitching game provides four pitches: fastball, change-up, curve, and slider. You choose a pitch by moving the joystick in one of four directions (a fastball is down, for instance). Then, by holding the joystick in one of the eight directions, direct the ball to the area you want it to go. It is possible, in this way, to simulate the sweeping curves that southpaws throw against left-handed batters or the inside fastballs popular on an 0-2 count.

Fielding is similar to that of most computer baseball games. Holding the handle to the right and pushing the fire button throws the ball to first base, holding it left throws to third base, and so on. In *Sporting News Baseball*, pushing the fire button while the joystick is in the neutral position throws the ball to the cutoff man, who relays it to the proper base. From the outfield, it is often much faster to get the ball to the correct base by throwing to the cutoff player first.

Repositioning fielders lets you place infielders and/or outfielders in specific locations for the current batter—an excellent idea, but the procedure is too clumsy to use frequently. With the joystick, maneuver a white cursor over the fielder you want to move, press the fire button, move the player where you want him, and again press the fire button to drop him off. This is fine for one fielder, perhaps, but moving the entire outfield, or both infield and outfield, takes a considerable amount of time. In other games, selecting a command to bring the infield in, put it at double-play depth, or shift the outfield left, serves much the same purpose without the inconvenience.

You can use pinch hitters (but not pinch runners), and you can replace your pitcher with a reliever. Unfortunately, warming up a reliever is not necessary, which takes some of the strategy out of the game. You may save a current game to disk at any time. Maximum game length is 18 innings, after which the game is stopped because of a curfew. At the end of each game, a screen of statistics appears.

Sporting News Baseball occupies a curious position in the realm of Commodore 64 baseball games. It is not as detailed statistically as *Computer Baseball* or *Pure-Stat Baseball*, nor does it offer quite the pitching excellence of *Hardball* or the base-running fun of *Star League Baseball*. It will not cause Amiga owners to give up *Earl Weaver Baseball*, which is superior in all but the base-running aspects. It is much better from all standpoints than *The World's Greatest Baseball Game*, and, as a two-player game, *Sporting News Baseball* is extremely well produced.

The problems it has occur in execution. The game plays slowly, and the batter's practice swing soon becomes exasperating. Joystick response in the fielding game is sluggish at times, and the base-running game could be a bit smoother, especially with extra-base hits. Still, the multipart screen display is well designed, and the game's complexity is high enough to keep even die-hards reasonably happy. The game's real strength becomes evident on long Saturday afternoons in winter when three or four people who know how to wield a joystick get together for multiplayer tournament action. The game could do a little more than it does, but, what it does, it does very well.

—Neil Randall

Sporting News Baseball
Epyx
P.O. Box 8020
600 Galveston Dr.
Redwood City, CA 94063
$39.95

JiffyDOS

Commodore disk drives, especially the 1541, are notoriously slow and difficult to access. In the past two years, however, a plethora of accelerator/DOS hardware accessories has flooded the market in an effort to speed things up. I like one called JiffyDOS.

Accelerators can be very confusing, even to seasoned Commodore enthusiasts. Let's first try to make some sense of the different methods.

There are three major types of add-ons: cartridges, serial bus ROM replacements, and parallel bus ROM replacements. Cartridges are the most popular because they are the least expensive and easiest to install, and they offer the widest range of extras. You can plug them into any 64 or 128. (Only one cartridge, to my knowledge, works in native 128 mode.)

Among the many added features are freezers/backups, hi-res screen dumps, disk and single-file copiers, monitors (including disk drive monitors), and predefined function keys. Some offer BASIC extensions, such as toolkit commands, and others function with more than one kind of disk drive.

Cartridges, though, have disadvantages, too. They tie up the expansion port and do not permit memory expansion or the simultaneous use of other cartridges. You can achieve considerable acceleration with cartridges, but not as much as you can with other methods. Many cartridges speed only load operations, leaving important disk functions, such as saving, validating, and formatting, at their normal slow speed. Perhaps most importantly, cartridge accelerators work only on *program* files. Many files, such as those used by word processors, databases, and spreadsheets, are sequential. Cartridges don't accelerate these at all. Most cartridges are priced in the $30–$70 range.

Serial and parallel ROM replacement methods require some internal installation, usually in both the computer and the disk drive. Although installation is straightforward, documentation is good, and user risk is low, mechanically uninclined computerists may shy away from tinkering inside their machines. Assembly takes about two hours, and the change is semipermanent.

Serial ROM replacement is preferable to other methods in that it leaves all connectors free. The expansion port is open for other cartridges or memory expansion, and the user port can accept a modem. Compared to cartridges, ROM replacement has additional advantages. There is an overall speed increase; all disk functions are accelerated; there is considerably less program/hardware incompatibility; and all file types share in the speed increase. Of course, ROM replacement offers few, if any, cartridge extras.

With respect to portability, serial ROM is a little better than parallel. There is no extra connecting-cable between the CPU and disk drive to unplug, wind up, or get in the way. Serial ROM replacements run in the $50–$80 range.

Be aware that a ROM replacement chip for only the computer and not the drive is the equivalent of a simple cartridge. Though less expensive than cartridges, these chips require installation and cannot be used with different machines. Their smaller capacity greatly restricts any extras. Slower speeds and restriction to program files also make

them similar to cartridges.

If you are interested in blinding speed for all functions and all file types, the parallel bus ROM replacement (computer and drive) is for you—if cost is no object. At $100–$200, this method can cost several times the serial option. Aside from the required connecting cable (which precludes concurrent modem usage), speed and price are the only significant differences between the two replacement types. Paralled ROM replacement is currently available only from overseas sources and for the 1541 disk drive. One word of warning: If the system does not replace the disk drive ROM as well as the computer Kernal, performance will be no better than (if as good as) a serial ROM replacement.

Dependable and reasonably priced, JiffyDOS greatly speeds up disk access.

Enter JiffyDOS from Creative Micro Designs. JiffyDOS employs the serial bus ROM replacement variety for both CPU and disk drive. It sells for $49.95 for the 64 version and $59.95 for the 128. The extra cost for JiffyDOS/128 is more than justified; you get an extra ROM—one for 64 mode and one for native 128 mode. I tested JiffyDOS/128 with a 1541 disk drive and experienced no problems.

JiffyDOS is available for all models of 64, SX64, and 128, as well as every type of disk drive: 1541, 1571, 1581, and most compatibles. For multiple-drive systems, additional ROMs are available for $24.95. CPUs and disk drives can be freely mixed and matched; any computer ROM will work with any drive ROM or combination of drives. Third-party compatible drives for which ROMs are currently available are FSD-1, FSD-2, Excel 2001, Enhancer 2000, Blue Chip, and Swan. The MSD-1 and MSD-2 versions are expected shortly. Instructions are specific to your computer and drive; specify your particular hardware configuration when ordering.

Installation is the simplest I have encountered. For all three JiffyDOS/128 ROMs, the mini-circuit boards are barely larger than the chips themselves. Simply pry the three ICs from their sockets and insert the new miniboards. Instructions and illustrations are excellent. Model differences in 1541 circuit boards are given special attention. (There are four types.) The substitute boards are so small that, unlike other products, they do not interfere with replacement of RF shields on either computer or drive.

JiffyDOS sports many fine features. Not the least of these are active company support and a money-back compatibility guarantee. If you find incompatible software or hardware, return JiffyDOS for a full refund. Creative Micro Designs admits that a few newer heavily copy-protected programs won't load. For these, there is the JiffyDOS on/off switch mounted on the computer and drive. (Only the 1541 drive requires a switch; mode selection is automatic with the 1571 and 1581.) Another unique feature: JiffyDOS can be switched in or out with power on. For some programs, this may permit turbo data-file access even when the original software won't fast-load.

Another real plus is the documentation. This well-produced booklet is among the most readable and error-free I've seen. It contains little jargon—just well-organized, useful facts. Particularly informative is the extensive commentary on how to get maximum speed out of JiffyDOS.

JiffyDOS has a particularly well-thought-out scheme of preprogrammed function keys. The definitions are switched out automatically during program execution to avoid possible interference, and they can be defeated or recalled at any time. They are designed to work in conjunction with a directory list to the screen. This greatly facilitates many disk operations, including file deletions.

Standard DOS Wedge syntax is followed, and 14 new commands have been added. These include the ability to list text files or BASIC programs directly from disk to screen or printer, dump screen to printer, lock/unlock files, unnew, and load and run ML programs in three different ways. On JiffyDOS/64, you can also disable/enable 1541 head rattle.

In addition, all commands can be used in program mode as well as in direct mode, and commands can be chained. String variables are allowed in command statements within BASIC. This facilitates the writing of utility programs that incorporate the JiffyDOS wedge.

One of JiffyDOS's many applications is in the musical area of MIDI—where the 64 or 128 exchanges data with digital synthesizers and drum machines. Since MIDI interfaces plug into the expansion port, and since MIDI data (sequencer and librarian files) are stored in sequential format, it is not possible to use cartridge accelerators. This makes JiffyDOS the lowest-cost method of accelerating MIDI files under conditions—such as in live performance—where loading time is a crucial factor.

In short, JiffyDOS is a dependable, reasonably priced product that greatly facilitates and speeds up disk access. It is highly software-compatible and is available in a multitude of computer/drive configurations. I particularly recommend it to those needing an expanded, user-friendly DOS Wedge and considerably faster data file communication within programs. For MIDI applications, databases, word processors, and spreadsheets, you'll save a lot of time and frustration.

—Art Hunkins

JiffyDOS
Creative Micro Designs
P.O. Box 646
50 Industrial Dr.
East Longmeadow, MA 01095
JiffyDOS/128, $59.95
JiffyDOS/64, $49.95
Extra drive ROMs, $24.95

Quick Brown Box

Here's a product that's easy to introduce in a few words. Quick Brown Box is a cartridge that is available with either 16K, 32K, or 64K of battery-backed RAM. A simple slide switch selects either 64 or 128 mode and adapts via software to either machine. The shelf life of the internal three-volt lithium battery is ten years.

Basically, QBB allows you to create your own RAM cartridges, containing any number of instantly available BASIC or machine language programs. The 32K QBB stores as many as 128 blocks; the 64K version, 255 blocks. A cartridge directory of up to 30 entries is accessible at the press of a key, and any program can be designated to autorun at power-up or reset (the cartridge contains its own reset button). QBB also provides autoboot capability for a disk drive, running the first program on disk.

Perhaps the most intriguing use for QBB is as a ramdisk in dedicated computer applications. Any program in QBB can be started automatically or accessed manually with a minimum of effort and delay. To list the box directory on a 64, press RESTORE; on the 128, press RUN/STOP and RESTORE. Any program already in memory remains intact. To run a program from this directory, type an asterisk (*) plus a one- or two-letter directory ID and press RETURN. Alternately, cursor up to the directory listing and press RETURN. In less than a second, the program is running.

The only major limitation is that QBB presently stores only program files. The upper 16K of the 32K and 64K versions can be set aside as a ramdisk. A natural use for this area is the storage of sequential data files. The *ramdisk* op-

tion, which must be specified during initialization, permits the programmer to store updates quickly and easily. Programs saved in this way are immune to system crashes.

With *ramdisk*, you can save programs directly to QBB. (An optional SAVE/REPLACE feature adds further convenience.) If you do not specify *ramdisk*, you must first save your file to disk and then load it to the QBB with a separate Manager program.

Quick Brown Box is particularly useful with productivity software—word processors, databases, and spreadsheets. My review cartridge was loaded with a copy of *SpeedScript*. It is tempting to imagine a QBB loaded with available *SpeedScript* utilities and the upper 16K as a ramdisk for the most recent versions of current text files. File updates could easily be saved with a few keystrokes, protecting text from possible system failure.

Here's a natural and welcome extension to the 64 and 128.

Once saved to disk, entire boxes can be reloaded easily. The contents of a box take only a minute or so to reload since an efficient turbo is embedded in the loader routine. Loading is also compatible with serial and parallel ROM-replacement accelerators—not cartridges.

Programs for the 64 and 128 cannot be mixed in the same box; a box is either a 64 box or a 128 box. Although a single 64 loader program replaces box contents, each mode has its own Manager program. Managers are the heart of QBB software and the means to creating and altering box contents. This is where you initialize boxes, set aside ramdisk space, load and delete program files, assign two-letter box directory IDs, and designate programs to autostart. You may also partition QBB for special applications. Partitioning sets aside a portion of the box for direct programming by the user. This advanced option is explained in considerable detail in the manual.

For reasons of compatibility, the Managers themselves do not contain fast-load and fast-save routines. (Boxes can take from two to three minutes to save.) QBB software is compatible with accelerator ROM replacement systems, such as JiffyDOS and DolphinDOS. While the QBB box loader program supersedes the ROM fast load, all other turbo functions of these ROMs work normally. DOS wedges that typically accompany these ROM replacements are another matter.

Compatibility with QBB software, which uses its own wedge to access cartridge files, is spotty. While DolphinDOS sports about 90-percent compatibility, JiffyDOS is mostly incompatible. Wedge coexistence is important because of the lack of disk support within QBB Managers. Managers do not include options such as scratch, format, and validate. Without this support, some kind of DOS wedge is virtually essential. I am happy to report that the QBB programmer is currently working on a fix for the JiffyDOS incompatibility problem.

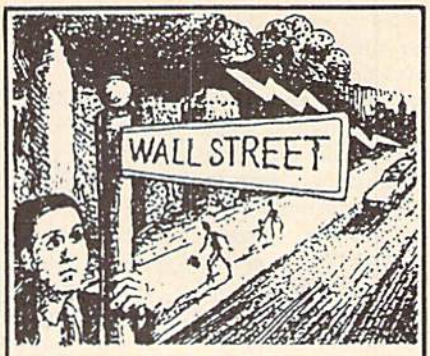
The QBB directory is quite different from a disk directory. One idiosyncrasy is that deleted files cannot be replaced in the same directory position. When a program is deleted, all other directory entries move up one position. Anything added always goes to the bottom.

As noted, QBB's documentation, though often technical, is excellent and thorough. (Contents need updating, however, since the autostart code is no longer as described.) Extensive instructions are given for advanced users on how to program the cartridge directly in either 64 or 128 mode. If you have ever wished to program your own autostart cartridge, this is your chance.

For 64 users, QBB software includes a version of Jim Butterfield's "Supermon+." The QBB is compatible with RAM-expansion units as well as cartridge expanders. (The documentation covers both of these, and it also offers a welcome section on troubleshooting.) A *checksum* program is included to guarantee the integrity of box contents. This program should be run immediately upon receipt of the Box to ensure the RAM contents are unchanged from the factory.

Quick Brown Box represents a whole new way of working with Commodore 64s and 128s. If you intend to work more than casually with it, you'll want to obtain the separate utility disk, which contains a variety of very useful public domain programs. Contents include updated 64 and 128 Managers, UNNEW and KILL commands, Basic Aid programs, copying and typewriter routines, screen dumps, fast load, save, and format routines, a terminal program, and CP/M RAMDOS utilities. Also included is a well-designed Rolodex/memo-book file program.

In regard to additional productivity software designed for QBB, I should mention two packages. First is the 128 CP/M ramdisk application *QDisk*, from Herne Data Systems of Toronto, which sells for $9.95. *QDisk* turns QBB into the equivalent of one or two CP/M drives in either 64 or 128 mode. At power failure or computer shutdown, the *QDisk*/QBB combination doesn't lose its contents, unlike the 1700/1750 RAM ex-



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pansion units. Second is *Ultraterm*, a terminal program currently undergoing beta testing.

Well-designed software, thorough documentation, and generous user support make Quick Brown Box a fine product. For many applications, including productivity and education, this is a natural and welcome extension to the 64 and 128. In ease and speed of access for semidedicated operations, it can be superior to a disk drive and, in some cases, can substitute for one. Like GEOS, QBB may well prolong the useful life of the 64 and 128 for years to come.

—Art Hunkins

Quick Brown Box
Brown Boxes
26 Concord Rd.
Bedford, MA 01730
64K—$129
32K—$99
16K—$69
Utility disk—$6

(Ed. note: At a recent World of Commodore Show, Barbara Mintz of Brown Boxes told us that QBB is compatible with the Commodore RAM expanders. She also noted that the 16K version may be unavailable in the near future because of the overwhelming customer preference for the 32K and 64K versions.)

Sesame Street Learning Library, Volume I

Sunny days, chasing the clouds away
On my way to where the air is sweet.
Can you tell me how to get,
How to get to Sesame Street?

These words, and their upbeat tune, are familiar to just about every child or parent in TV-land. Big Bird, Ernie, Bert, Grover, and all the other Sesame Street characters have successfully made the transition to toys, books, and various educational materials. So it should come as no surprise that they've found a home in the world of computers, as well.

In fact, you already may have seen the three programs included in Volume I of the *Sesame Street Learning Library: Astro-Grover, Ernie's Magic Shapes,* and *Big Bird's Special Delivery*. They've been available separately for some time, but now Hi Tech Expressions has bundled the three programs into one convenient package for curious three- to six-year-olds.

First, *Ernie's Magic Shapes*. Here's Magician Ernie onstage with his wand and hat, pulling shapes out of thin air for children to match. Some levels show a single basic shape, while other levels present pictures consisting of several small shapes. On the levels with picture shapes, the child builds an identical picture by choosing individual shapes that match the originals. This adds variety to the program and carries it beyond a simple matching game.

Next, *Big Bird's Special Delivery*. Big Bird and Little Bird have a package delivery service, but they need help in getting the right packages to the right stores. Children help by matching things up. In this natural sequel to *Ernie's Magic Shapes*, two levels allow for a game of exact matching or a game of classification.

And finally, *Astro-Grover*. Grover is all decked out in his space helmet, having fun with the Zips from Zap. Through counting, adding, and subtracting, children help the Zips build a city and get back to their mother ship. They even help *Astro-Grover* blast a spaceship into space. This program introduces simple addition and subtraction and is a fun way to improve a child's counting skills.

The approach here is to entertain children while educating them painlessly.

Each program makes good use of sound and color graphics to keep the child interested. The most successful program in this regard, *Astro-Grover*, includes a finely detailed drawing of Grover dancing to lively space music at the end of each completed round. In *Ernie's Magic Shapes*, Ernie rewards correct answers with a hopping bunny, and, in *Big Bird's Special Delivery*, Big Bird uses flashing lights and whistles. The higher the age level targeted by the program, the more sophisticated is its appearance. Each of the graphics is a faithful rendering of the Sesame Street characters. Toddlers easily recognize them, a situation that sometimes causes little ones to demand time with programs they can't quite handle. Of course, it also makes them that much more eager to learn.

The number of keys the child must use is kept to a minimum. No more than four keys are used, except in *Astro-Grover*, which uses the number keys as well. (This version of *Astro-Grover* does away with the plastic overlay found in earlier editions. Instead, it uses the function keys and provides a small template for their use—a definite improvement.)

Basically, these programs make it as easy as possible for children to learn how to play. Their approach is to entertain children so they'll play long enough to be painlessly educated.

So what makes the *Sesame Street Learning Library* package different from similar educational packages—besides getting three programs at once? The answer is the Learning Guide.

Many of us have a recurring problem when we buy software for our children: We don't know how to help them get the most out of it. Sometimes we set our children at the keyboard, boot the program, and just let them have at it. Other times, we set them on our laps and dictate each choice. Either of these methods can be the wrong way to handle things. The Children's Television Workshop, with its vast experience in the field of education, has provided a guidebook to help parents accompany their children along the sometimes bumpy path of computers and software.

The Learning Guide provides concrete suggestions for dealing with the difficulties that may come up in using the program. It also discusses activities a parent and child can do away from the computer to further develop the skills the program is building. This encourages the child, who in turn gets better at the game, which makes it even more rewarding for the child to play, which helps the child improve the skills even more, which . . . you get the idea.

When all is said and done, it's the Learning Guide that unifies the package and transforms it. The separate packages have always been excellent educational programs—and now that the packages have been combined with the Learning Guide, you can truly say that the whole is greater than the sum of the parts.

—David and Robin Minnick

Sesame Street Learning Library,
Volume 1
Hi Tech Expressions
584 Broadway
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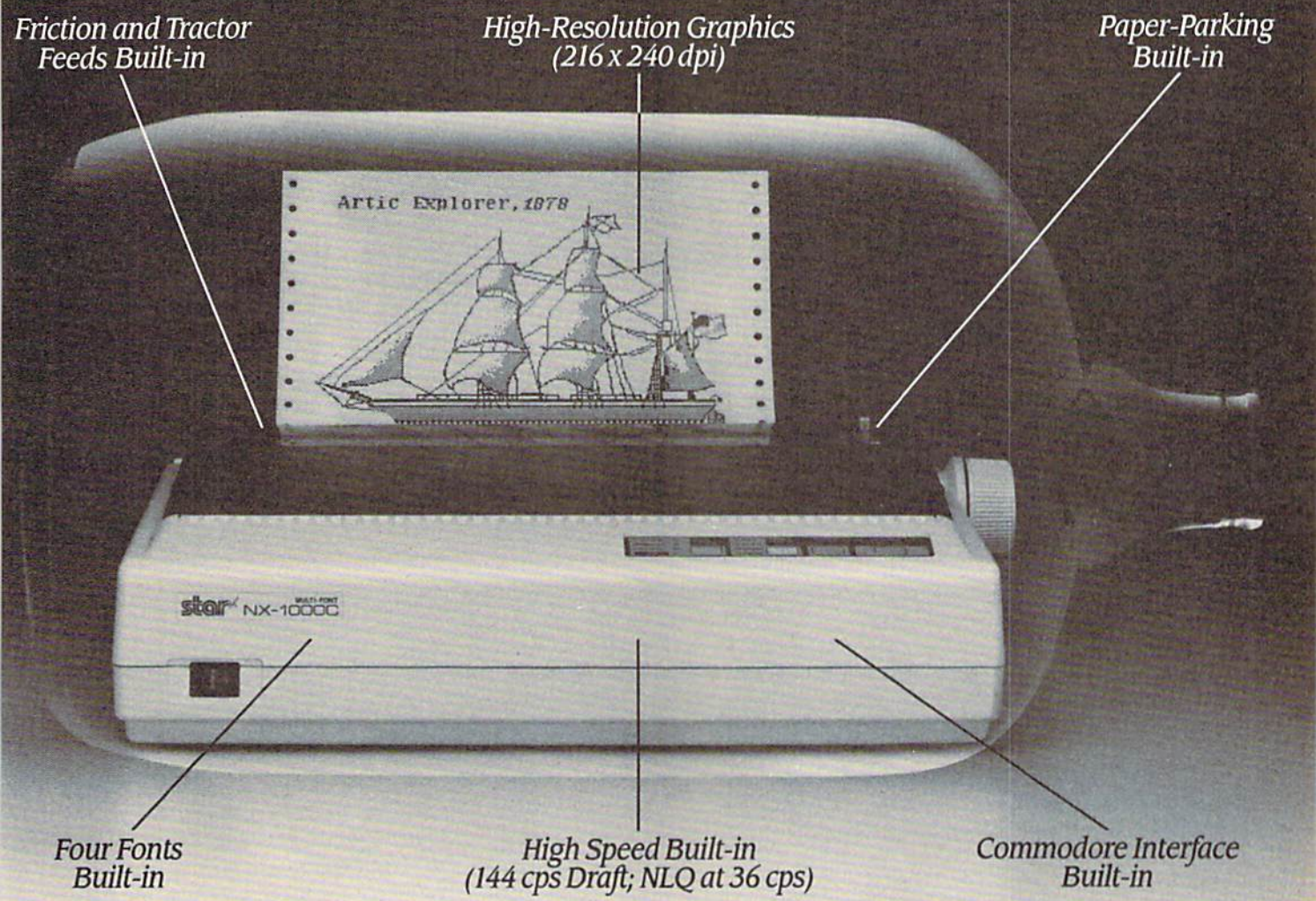
The new Star Multi-Font. How did Star get it all in there?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Do you have a question or a problem? Have you discovered something that could help other Commodore users? We want to hear from you. Write to Gazette Feedback, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We regret that, due to the volume of mail received, we cannot respond individually to programming questions.*

More on Moving BASIC

I'm writing in regard to your answer to Darren Hembd's question on moving the start of BASIC in November "Feedback." All Mr. Hembd wanted to know was why he got a syntax error. Whoever answered his question gave a reply that was nothing but meaningless gibberish and double-talk to anyone just beginning to program. I would hate to ask this individual what time it was. He would probably tell me how to make a watch.

The correct answer is that the byte at the start of BASIC must be 0. Therefore, when you move the start of BASIC, store a 0 just before the start location. So, when Mr. Hembd moved BASIC to 3072 by POKEing 44,12, he should have followed with a POKE 12*256,0 or POKE 3072,0. Then his program would run.

Bernhardt Sandler
Venice, CA

Please accept our apologies—we missed the forest for the trees.

*The solution you've offered our readers is basically correct, but it needs a few slight modifications. First, you're assuming that the low byte of the start-of-BASIC pointer at location 43 is a 1 (its default value). BASIC text normally starts at location 2049 (256*8+1), and location 2048 contains a 0. If BASIC has been moved previously, this may no longer be the case. To be on the safe side, then, POKE a 1 into location 43. Second, BASIC's other pointers should be reset after adjusting the start-of-BASIC pointer. To do this, execute a NEW command following the POKEs.*

So, the complete command sequence to move the BASIC program to 3072 is

```
POKE44,12:POKE43,1:POKE12*256,0:
NEW
```

Short-Order Words

I recently purchased a commercial disk called *The Writer* by Spinnaker. On the front of the disk is the word processor, and on the back of the disk is the dictionary sequential file and a spell-checking program which contains a 100,000-word (I repeat: 100,000!) spelling checker. The sequential file uses 637 blocks.

My question is this: How is it possible for 637 blocks to contain 100,000 words? Please explain.

Frederick J. Carleton
Metairie, LA

A good question. Since a block can contain a maximum of 254 bytes of data, it would seem that a 637-block file could hold only 161,798 characters. If we assume that the average English word is five characters long (a historical approximation often used by typing teachers), it would seem that a file that long could only hold about 32,000 words.

However, a dictionary has a unique property—it's in alphabetical order. We can use this property to compress the dictionary file. Here's part of a dictionary:

```
cab cabal cabala caballero cabana
```

That list is 33 characters long. Now, we'll compress the list by indicating how many letters each word has in common with the preceding word.

```
cab3al5a4llero4na
```

Only 17 characters! Read it like this: cab, *3 letters from* cab *plus* al—cabal, *5 letters from* cabal *plus* a—cabala, *4 letters from* cabala *plus* llero—caballero, *4 letters from* caballero *plus* na—cabana.

Other savings take place when you consider that there are only 26 characters in the alphabet. Twenty-six letters can be expressed in six bits. Since a byte holds eight bits, we can save two bits per letter if we pack the bits in six-bit groups.

Using MLX

Is there any possible way I could use the Commodore 64 version of "MLX" to enter a Plus/4 machine language program? If so, please tell me the modifications I need to make to MLX.

Martin George
Hamilton, IL

There are currently two versions of "MLX" that appear regularly in Gazette: *one for the 64, the other for the 128. These programs are designed to ease the task of entering machine language (ML) programs on their respective machines. MLX for the 64 lets you enter 64 machine language programs on a 64; the 128 version allows you to enter 128 ML programs on a 128.*

In order to use MLX to type in a machine language program, the listing for the program must be in MLX format. An MLX listing—several can be found in the back of any Gazette*—is in hexadecimal notation. Each line in such a listing contains an address, eight data bytes, and a checksum byte. These listings are created by our own in-house lister program. The lister converts a 64 machine language program to a 64 MLX listing or a 128 ML program to a 128 MLX listing.*

Now, to address your question. It's true that we could modify the MLX program so it would run on the Plus/4. But this wouldn't do you any good unless we also provided you with MLX listings for Plus/4 machine language programs. A Plus/4 MLX wouldn't convert a 64 or 128 machine language program to a

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Plus/4 ML program. For example, if you entered a 64 MLX listing with this Plus/4 MLX, you'd still end up with a 64 machine language program. And since the instructions and addresses within this program would be specific to the 64, it's very unlikely it would run on the Plus/4. It would be like installing a Ford transmission in a GM car and expecting the car to run.

Currently, only a few ML programs for the Plus/4 appear in our magazine. And those that do are generally short enough to be entered without much trouble using a BASIC loader. On this basis then, we probably won't publish a Plus/4 MLX anytime soon.

ML Memory Move

Can you show me how to do the following in machine language?

```
FOR I=40960 TO 49151:POKE I,PEEK
  (I):NEXT I
```

Brad Ogden
Des Moines, IA

The line you've listed here copies BASIC ROM to the underlying RAM. Because it takes BASIC over a half a minute to execute the 8000 PEEKs and POKEs in this line, this is an ideal application for machine language. And the code is short—only 25 bytes.

This routine (shown boxed, below) relies on a technique known as zero-page indirect addressing. Locations 251 and 252 contain the base address of the memory that's being moved, and .Y serves as the offset to this address.

In this case, since you're POKEing the same address that you're PEEKing and you're moving an even chunk of memory, this is a relatively simple routine. Other types of memory-moving routines—moving memory up and down or moving odd chunks of memory—require more sophistication. Most books on machine language include a discussion of these routines. For specific examples, see Machine Language Routines for the Commodore 64 and 128, *from COMPUTE! Books.*

The program below is a BASIC loader containing the above machine language routine in its DATA statements. To install the memory-moving routine, just run the loader. Then, when you're ready to move BASIC to the underlying RAM, type SYS 828.

```
10 FORI=828TO852:READA:POKEI,A:
   NEXTI
20 DATA 169,0,133,251,160,160
30 DATA 132,252,160,0,162,32
40 DATA 177,251,145,251,200,208
50 DATA 249,230,252,202,208,244,96
```

---

128 RAM Expansion

I'm having problems STASHing and FETCHing BASIC programs on the 128's 1750 RAM Expansion Module. Can you tell me how to get the length of my program so I'll know how many bytes to stash? I've been using a starting address of 7169. Also, when I fetch the program back into memory, it hasn't used any memory when I type FRE(0), and if I press RETURN over a line number, the computer locks up. What am I doing wrong?

Nick C. Thomas
Asheville, NC

Before you attempt to stash your program, you need to know exactly where it's located in memory. Normally on the 128, the BASIC program resides at 7169. But if you've used the hi-res screen since the computer was turned on, it may be located at 16385. (The GRAPHIC commands move BASIC text to 16385 and reserve locations 7168–16383 for the hi-res screen.) By executing a GRAPHIC CLR command, you can be certain of the program's location. If BASIC text has been moved up, this command will move it back to 7169. In the process, it stores a zero byte in 7168 (as required by BASIC) and resets the start- and end-of-BASIC-program pointers.

After locating your program at 7169 with GRAPHIC CLR, you need to determine its length. To do this, subtract BASIC's starting address from the end-of-BASIC-program pointer at 4624:

```
?PEEK(4624)+PEEK(4625)*256-7169
```

At the same time, record the values that are in location 4624 and 4625 for later use.

Now you're ready to stash your program. Suppose the program is 1000 bytes long and you want to store it in bank 1, location 0 of the expansion RAM. You'd execute the following line:

```
STASH 1000,7169,0,1
```

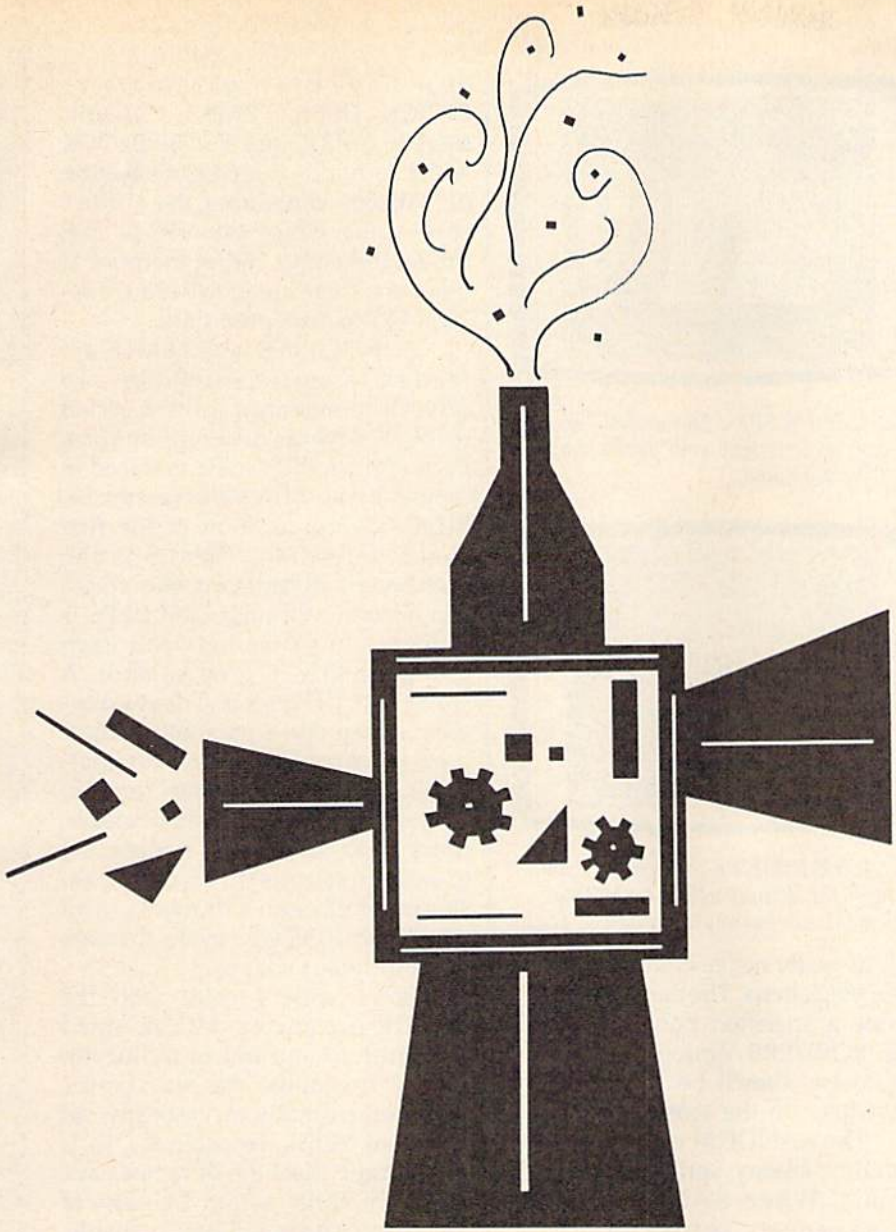
Later, you could recall the program from the expander with

```
GRAPHIC CLR:FETCH 1000,7169,0,1
```

Here, the GRAPHIC CLR command ensures that the start-of-BASIC-program pointer is at 7169 and that location 7168 contains a zero byte.

In your example, you typed ?FRE(0) at this point and found that it was unaffected by FETCH. FRE(0), on the 128, reports the number of bytes that are available for program storage. The FRE function determines this number by taking the difference between the top-of-BASIC pointer at 4626 and the end-of-BASIC-program pointer at 4624. The reason this number remains unchanged after you recalled your program is because the end-of-BASIC-program pointer isn't updated by FETCH. It still contains a value based on a prior BASIC program (or possibly no program at all if you've just NEWed). And, when you press RETURN over a line, BASIC attempts to insert this line into the program—a process that relies on the end-of-BASIC-program pointer. With the pointer containing a meaningless value, the computer becomes confused and locks up. To prevent this, after you've FETCHed your program, reset the pointer. This can be done by POKEing the values you recorded before STASHing back into 4624 and 4625.

```
; Move BASIC ROM to RAM
;
BASIC = 40960
        LDA   #<BASIC    ;Store BASIC interpreter address
        STA   251        ;in zero page for indirect addressing
        LDY   #>BASIC
        STY   252
        LDY   #0         ;Use .Y as offset and zero it
        LDX   #32        ;We're moving 32 pages (32 × 256 = 8K)
LOOP    LDA   (251),Y    ;Get byte from ROM using indirect addressing
        STA   (251),Y    ;Store in underlying RAM at same address
        INY              ;Next byte
        BNE   LOOP       ;Move 256 bytes
        INC   252        ;Increase pointer high byte
        DEX              ;Next page
        BNE   LOOP       ;Continue until .X is 0
        RTS              ;We're done—return to BASIC
```



The Great Arcade Machine

Hubert Cross

Ever had a brilliant idea for an arcade game? If you had trouble translating your idea into a program, you'll want "The Great Arcade Machine." Use it to create games like pinball, Pac-Man, Space Invaders, or an infinite variety of others. Your imagination is the limit. For the 64.

Designing a game can take hours of machine language programming. A detailed knowledge of your computer's architecture is also required. Because the task is so daunting, many good game ideas never become a reality. Now there's "The Great Arcade Machine," a program that allows you to create games interactively.

Arcade Machine does the hard work—and at machine language speed. The net result is that a game that could take weeks to write in machine language can be created in a very short time. All you have to do is learn how to use and change Arcade Machine's parameters. Best of all, Arcade Machine adds 31 new commands to BASIC, allowing you to control your game from BASIC.

Getting Started

Program 1, "Arcade Machine," and Programs 3 and 4 are written entirely in machine language, so you'll need to use "MLX" to type them in. When MLX prompts you, respond with the values listed below.

Program 1:

Starting address:	**0801**
Ending address:	**1BA8**

Program 3:

Starting address:	**30C0**
Ending address:	**3E7F**

Program 4:

Starting address:	**7500**
Ending address:	**7897**

After you've typed in all the data, be sure to save a copy to tape or disk before leaving MLX. Save Program 1 with the name ARCADE MACHINE, Program 3 with the name SPRDATA, and Program 4 with the name PARAMS.

Program 2 is written in BASIC. Use "The Automatic Proofreader" to type it in. Save it with the name BOOT. If you are using ARCADE MACHINE with tape, you must change lines 60 and 90 of Program 2 as follows:

```
60 PRINT"{HOME}{5 DOWN}{BLU}
   PRINTCHR$(147):CLOAD"A$"
   SPRDATA" A$":CLOAD"A$
   "PARAMS"A$
90 LOAD"ARCADE MACHINE",1
```

After you've typed in the programs, you're ready to see what Arcade Machine can do. Plug a joystick into port 2; then load and run BOOT. Use the joystick to move the helicopter. You can shoot the saucers and drop bombs on the ship with the fire button, but watch out—colliding with a saucer is fatal, and the ship shoots back at you.

The Editor

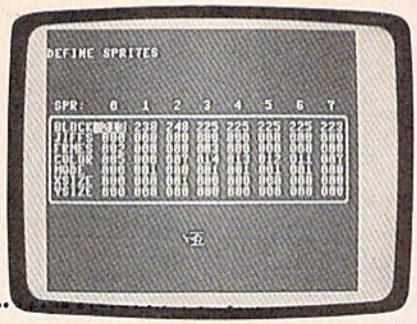
Arcade Machine features a built-in editor that allows you to design games on the fly. The editor has 18 windows that control sprite movement, sound, collisions, firing, and other details. The editor is activated by the command WINDOWS. Temporarily disregard the sprites on the screen and type *WINDOWS*. Arcade Machine's first window, the OPTIONS window, appears on the screen.

In the editor, the f3 and f1 keys move you forward and backward through the windows, respectively. The f7 key halts all sprites and displays them at the bottom of the screen; f5 activates all sprites. Number keys 0–7 toggle sprites on and off individually. The cursor keys move your cursor inside Arcade Machine's windows. The + and − keys increment and decrement the highlighted value. The space bar is active on two windows (the SOUND and EXPLODE windows). Press the space bar on these windows to test a sound or explode a sprite. Pressing the RUN/ STOP key returns you to BASIC.

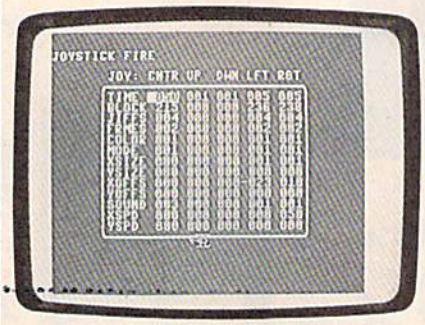
Arcade Machine has six basic options: JOYSTICK, COLLISIONS, REPLACE, BORDERS, RANDOM, and FIRE. Each of these options has one or more windows for changing parameters, but each option can be enabled or disabled from this window. Set an option to 0 to disable it or to 1 to enable it.

When the JOYSTICK option is enabled, you control sprite 0 with a joystick plugged into port 2. When COLLISIONS is enabled, Arcade Machine performs the action you've selected when two sprites touch. For example, Arcade Machine has been instructed to explode the ship when your bomb hits it.

When the REPLACE option is set to 1, Arcade Machine automatically replaces destroyed sprites. Use



The DEFINE SPRITES window lets you specify exactly how your sprite shapes will be animated.



The JOYSTICK FIRE window lets you control the actions which take place when the fire button is pressed.

this to create never-ending waves of attacking aliens. The sprites will stay inside a specified boundary when the BORDERS option is enabled; otherwise, they'll be free to move anywhere on the screen.

The RANDOM option controls whether enemy sprites move randomly. When RANDOM is enabled, enemy sprites appear to move in a random manner. Although their movement appears random, another window lets you decide precisely where they can change movement, how often, and in what direction. When FIRE is set to 0, sprites cannot fire at each other. When it is set to 1, sprites are free to blast each other. Other windows control the frequency, direction, and speed of each shot.

Displaying Sprites

Before you move to the next window, make sure all options are enabled. If an option is disabled, changing parameters in one of its corresponding windows has no effect. This can be confusing when you are using the editor for the first time. After all options are enabled, press f3.

The next window is the DEFINE SPRITES window. This window has seven parameters: BLOCK, JIFFS, FRMES, COLOR, MODE, XSIZE, and YSIZE. BLOCK is the location of a 64-byte section of memory containing the sprite's shape data. Since the VIC-II chip can address only 16K of memory at one time, there are 256 (0–255) possible blocks for sprite data.

BLOCK, JIFFS, and FRMES are related to sprite animation. To achieve animation, a sprite is cycled through several different shapes. Each sprite's shape data is stored in consecutive blocks of memory. BLOCK is the location of the first shape definition, FRMES is the number of definitions the sprite should cycle through, and JIFFS is the time in jiffies between each change (a jiffy is 1/60 second). A sprite with JIFFS set to 0 does no cycling. Once these parameters have been set, Arcade Machine automatically animates the sprites for you. To examine the animation closer, press f7 to disable the sprites. Set one of the saucers' JIFFS to 60 (one second between changes), and you'll see it slowly cycle through three different shapes.

Set a sprite's color with the COLOR parameter. MODE shifts the sprite in and out of multicolor mode. To double the size of the sprite horizontally or vertically, set XSIZE or YSIZE, respectively, to 1.

Arcade Machine does not have a built-in sprite editor. Use one of the many sprite editors available, such as "Mob Maker," "Sprite Magic," or "Sprite Manager" (all from *Gazette*) to create your sprites. Later, you'll see how you can load sprite shape data into Arcade Machine using the DLOAD or CLOAD command.

Sounds

The proper use of sound is important to any game. Actions such as dropping bombs, launching missiles, firing machine guns, and creating explosions are all enhanced by the proper use of sound. Arcade Machine allows you to create interesting sounds in the next window, the SOUND window.

Arcade Machine allows you to define up to eight different sounds. To change a sound, move the cursor to a sound column and enter a WAVE number. Wave numbers are 1, 2, 3, or 4 for a triangle, sawtooth,

square, or noise waveform, respectively. There are 96 different notes available (0–95) for eight octaves (see Appendix E in the *Programmer's Reference Guide*). NOTE1 is the starting note of the sound, NOTE2 is the ending note, and TEMPO is how fast the sound rises or falls. A TEMPO value of 0 gives you a steady note. The sound envelope is controlled by the ATTACK, DECAY, SUSTAIN, and RELEASE parameters. TIME controls how long the sound plays. When TIME is 0, the sound never stops. To hear the sound, press the space bar.

Arcade Machine uses voice 1 for your sprite's fire and voice 2 for other sounds. Voice 3 is used to generate random numbers. Because there are only two voices available for sounds, conflicts may arise. If one voice is used to play two sounds simultaneously, one sound cuts off the other.

Joystick Controls

In games like *Space Invaders*, your sprite can move only left and right. In games like *Pac-Man*, you can't stop your sprite by centering the joystick. In other games, your sprite stops when you center the stick, but you can shoot in the direction you're facing. Arcade Machine has two windows for controlling these actions: JOYSTICK and JOYSTICK FIRE.

The JOYSTICK window controls the movement of your sprite. It shows five directions: CNTR, UP, DOWN, LEFT, and RGHT. The ENABLE parameter determines whether your sprite can move in these directions (CNTR controls whether your sprite stops moving when the joystick is centered). BLOCK, JIFFS, and FRMES control animation of your sprite when it's moving. SPDEN determines whether your sprite changes speeds when the joystick is moved. Note the distinction between SPDEN and ENABLE: If SPDEN is set to 0, the sprite can turn and fire, but not move. If ENABLE is set to 0, however, the sprite cannot turn, fire, or move. XSPEED and YSPEED are your sprite's speed when moving in each direction.

The joystick parameters can be changed interactively, but you have to move the joystick to see the difference. If the joystick is up, for instance, you have to push it in another direction and then push it up again to see the change. If your joystick is centered, you have to move it and then center it again to see the change.

Table 1: Collision Actions

Value	Action
0	IGNORE
1	OFF
2	EXPLODE
3	DIE
4	STOP (XSPEED = 0; YSPEED = 0)
5	FALL (XSPEED = 0; YSPEED = 16)
6	YBOUNCE (YSPEED = −YSPEED)
7	XBOUNCE (XSPEED = −XSPEED)
8	YSLIDE (YSPEED = 0)
9	XSLIDE (XSPEED = 0)

The JOYSTICK FIRE window controls your sprite's fire. The BLOCK, JIFFS, and FRMES parameters control the animation of your sprite's shot. COLOR, MODE, XSIZE, and YSIZE control your shot's color and size. XSPEED and YSPEED control your shot's speed. TIME is the time, in jiffies, before you can shoot again. If you want to simulate a rate of fire of one shot per second, set TIME to 60. To simulate a machine gun, set TIME to 5. To disable fire in a certain direction, set that direction's TIME to 0. XOFFS and YOFFS are horizontal and vertical distances from your ship, where your shots begin. SOUND is the number (1–8) of the sound your ship makes when it fires. If you set SOUND to 0, your ship makes no sound when it fires.

Explosions!

The next six windows—EXPLODE, ON COLLISION, SOUND ON COLLISION, POINTS ON COLLISION, ON SPRITE/DATA COLLISIONS, and REPLACE—are all related. These windows control collisions between sprites and between sprites and data; they also control the shape and sound of explosions.

The EXPLODE window controls how an explosion looks and sounds. BLOCK, JIFFS, and FRAMES control the animation of the explosion. COLOR, MODE, XSIZE, and YSIZE control the color and size of the explosion. SOUND controls which sound is played when an explosion occurs. You can test an explosion by following this procedure: Press f7 to disable the sprites, move the cursor to the column of the sprite you wish to explode, and then press the space bar.

Table 2: Speed Changes

Value	Meaning
0	No speed change
1 or −1	Randomly change the sprite's X speed
2 or −2	Randomly change the sprite's Y speed
3 or −3	Randomly change both the sprite's X and Y speeds

The ON COLLISION window tells Arcade Machine what action to take when the sprite in the column on the left collides with the sprite in the row at the top. Values for these actions are shown in Table 1.

DIE is a sequence of actions common in many games: Halt all sprites, explode the sprite, pause, and then turn all sprites off.

The SOUND ON COLLISION window determines which sound plays when two sprites collide. A value of 0 means no sound plays. The POINTS ON COLLISION window controls the points that are added to your score when a collision occurs. The ON SPRITE/DATA COLLISIONS window is exactly like the ON COLLISION window, except that it controls collisions between sprites and background data.

The REPLACE window controls how sprites reappear. Delay is the amount of time before the sprite reappears, and XPOSITION and YPOSITION are the base column and row where the sprite reappears. +RND is the largest random number that can be added to the sprite's base position. For example, if you want a sprite to reappear anywhere between Y = 50 and Y = 200, set its YPOSITION to 50 and its +RND to 150. If you want a sprite to always appear in the same row or column, set +RND to 0. XSPD and YSPD are the sprite's initial X and Y speeds. The last parameter, +/−, is used to change the sprite's speed. The +/− values are shown in Table 2.

To test the REPLACE parameters interactively, press F5 to turn

all sprites off. This forces Arcade Machine to replace them.

Setting Boundaries

The next four windows are used to set boundaries for the sprites. The BORDERS window is used to set boundaries for each sprite. The ACTION AT BORDERS window controls what happens when a sprite reaches one of its boundaries, and SOUND AT BORDERS controls which sound is played. POINTS AT BORDERS controls the number of points added to the score when a sprite reaches a boundary.

Use the BORDERS window to define a window in which each sprite can move. For example, if you want a saucer to be restricted to the top half of the screen, set its BOTTM parameter to 99. The left and right borders are a little tricky. Since one byte holds only 256 values, border numbers are multiplied by 2 to get the actual screen coordinates. Thus, you should limit left and right borders to the range 0–159 (setting the left or right border to a number larger than 159 may cause the sprite to "wrap" to the left side of the screen at odd times).

The windows ACTION AT BORDERS and SOUND AT BORDERS control the actions and sounds that occur when a sprite reaches a border. ACTION AT BORDERS is a number in the range 0–9 corresponding to the actions shown in Table 1. SOUND AT BORDERS is the sound number to play when a sprite reaches a border (0 means no sound is played). If the score should be increased when a sprite reaches a border, enter the number on the POINTS AT BORDER window. Most of the numbers on this window should be 0—it wouldn't make sense to increase the score when a saucer reached its left or right border.

Random Movement

The ENABLE RANDOM MOVE window is used to select which sprites can randomly change movement. The RANDOM MOVE window controls the randomness of a sprite's movement. Each column in this window defines an area of the screen. If a sprite is inside one or more of these areas, the program may change its speed according to your specifications. If the sprite is within several boundaries, it reacts to only one of them (chosen randomly). If the sprite is not within a listed boundary, the speed of the sprite is not changed. *Note: You'll probably want to disable random movement for sprites 1 and 7. Otherwise, when you or an enemy fires, the shot may move randomly.*

The first parameter, TIME, is the time, in jiffies, that must pass before the speed can be changed again. A column is disabled if its TIME is 0. TOP, BOTTM, LEFT, and RIGHT define a rectangular region of the screen. If Arcade Machine decides to change a sprite's movement, XSPD and YSPD are the sprite's new horizontal and vertical speeds. The values for +/− are listed in Table 2.

Enemy Fire

All good shoot-'em-up games have enemy ships that shoot back at you. The ENEMY FIRE window allows you to control exactly how good the enemy ships are. RATE controls how often enemy sprites fire (if you don't want them to fire at all, set their RATE to 0). DIRECTION controls the direction an enemy ship may fire. To allow a sprite to shoot upward, set DIRECTION to 0; use 1 to let it fire downward. A DIRECTION of 2 means the sprite can fire to the left; 3 means it can fire to the right.

When an enemy sprite's AIM is set to 1, it will fire only when lined up properly with your sprite. When AIM is set to 0, the enemy ship will fire randomly. SPEED is how fast the shot travels when fired. SOUND is the sound that plays when the sprite fires. As with the JOYSTICK FIRE window, XOFFS and YOFFS are horizontal and vertical distances from your ship, where your shots begin.

Sprite 7 is used for enemy fire. It must be off for ENEMY FIRE to work. You should have Arcade Machine turn it off when it reaches its borders (set its ACTION AT BORDERS parameters to 1).

A good way to test the ENEMY FIRE parameters interactively is to turn off COLLISIONS, set the RATEs to their maximum (255), press f7 to put all sprites at the bottom, press 7 to toggle off sprite 7, and then move the chopper in front of the enemy sprites.

BASIC Commands

Arcade Machine adds a number of commands to BASIC to allow you to control parameters without using the editor. In the following commands, square brackets indicate that the parameter is optional.

SPRITE [*sprite number*]. The SPRITE command turns on a sprite. Typing *SPRITE* without a sprite number turns on all sprites.

OFF [*sprite number*]. The OFF command turns off a sprite. Typing *OFF* without a sprite number turns off all sprites.

HALT [*sprite number*]. The HALT command stops a sprite. Typing *HALT* without a sprite number stops all sprites.

MOVE *sprite number,x,y*. The MOVE command changes a sprite's X and Y velocities.

XMOVE *sprite number,x*. The XMOVE command changes a sprite's X velocity.

YMOVE *sprite number,y*. The YMOVE command changes a sprite's Y velocity.

COLOR *sprite number,c*. The COLOR command changes the color of a hi-res sprite.

MULTIC *c1,c2*. The MULTIC command changes the colors of multicolor sprites.

MODE *sprite number,n*. The MODE command controls whether a sprite is in hi-res or multicolor mode. When *n* is 0, the sprite is displayed in hi res; when *n* is 1, the sprite is shown in multicolor mode.

PRIORITY *sprite number,n*. The PRIORITY command sets the priority of a sprite. When *n* is 0, the sprite has priority over background data. When *n* is 1, background data has priority.

ANIM *sprite number,block, frames,jiffies*. The ANIM command animates a sprite.

REL *sprite number,x,y*. The REL command changes a sprite's X and Y coordinates.

XREL *sprite number,x*. The XREL command changes a sprite's X coordinate.

YREL *sprite number,y*. The YREL command changes a sprite's Y coordinate.

SIZE *sprite number,xsize,ysize*. The SIZE command sets a sprite's X and Y sizes. When *xsize* and *ysize*

are 0, the sprite is displayed normally. An *xsize* of 1 expands the sprite horizontally; a *ysize* of 1 expands it vertically.

SOUND *sound number*[,*note*]. The SOUND command plays one of the eight sounds. The *note* value is optional.

BLAST *sprite number*. The BLAST command explodes a sprite (you must set window EXPLODE parameters first).

DLOAD *"filename"*. The DLOAD command loads a parameter or sprite shape data file from disk.

DSAVE *"filename"*. The DSAVE command saves a parameter or sprite shape data file to disk.

CLOAD *"filename"*. The CLOAD command loads a parameter or sprite shape data file from tape.

CSAVE *"filename"*. The CSAVE command saves a parameter or sprite shape data file to tape.

SCREEN *number*. The SCREEN command controls where the screen is located in memory. *Number* is the starting location of the screen divided by 256. For instance, to change to the screen used by Mob Maker, enter SCREEN 128 (32768/256=128). To return to the normal screen, enter SCREEN 4.

ENABLE [*joystick,collisions,replace,borders,random,fire*]. The ENABLE command turns on options. ENABLE by itself turns on all options.

DISABLE [*joystick,collisions,replace,borders,random,fire*]. The DISABLE command turns off options. DISABLE by itself turns off all options.

Putting It All Together

BASIC sprite games are easy to create using Arcade Machine. The BOOT program demonstrates what's necessary to get started—load Arcade Machine, a parameter file, and a sprite data file. All you need to add to the BOOT program is a loop to display the score. The loop should repeat until the number of remaining lives is 0; then it might disable all sprites, display a PLAY AGAIN? prompt, and ask for a response. If the response is no, the game ends; otherwise, your game should reset the score and number of lives and then jump back to the loop.

Here are the addresses you'll need to PEEK from or POKE to BASIC:

700–70	X position of sprites 0–7
708–715	Y position of sprites 0–7
716–723	Lives of sprites 0–7
724–725	SCORE (low byte/high byte)
726	Mirror of sprite/sprite-collision detect register $D01E
727	Mirror of sprite/data-collision detect register $D01F

Remember to POKE 0 into a mirror location after you've read it.

See program listings on page 87.

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bug-swatter

Modifications and Corrections

● In "Power BASIC: Program Merge" (December 1988), the article incorrectly states that the command **SYS49152,*"filename",drive#*** should be used to merge a program on disk with the one in memory. The comma after SYS49152 is not only unnecessary but, in fact, causes an error if it is used. The correct command is **SYS49152*"filename",drive#***.

● Several users have had trouble printing files using "Speed Columns" (October 1988 and *SpeedScript Disk*). With some printers, Speed Columns prints files in all lowercase. If you've had this problem, enter the following program to correct it:

```
CS 10 CLR:PRINTCHR$(147):A=0:B
      =0:C=0:I=0:A$="":B$=""
BD 20 PRINT"{CLR}{RVS}
      {2 SPACES}INSERT DISK CO
      NTAINING SPEEDCOLUMNS
      {3 SPACES}":POKE198,0
PP 30 GETK$:IFK$=""THEN30
PH 40 PRINT"{CLR}READING...":O
      PEN15,8,15:OPEN1,8,2,"0:
      SPEED COLUMNS,P,R":A=0
JM 50 GET#1,A$:IFA$=""THENB=0:
      GOTO70
CE 60 B=ASC(A$)
PC 70 GOSUB150:IF(STATUSAND64)
      THENCLOSE1:GOTO90
DG 80 GOTO50
HS 90 FORB=0TO23:READC:POKE942
      6+B,C:NEXT
PA 100 PRINT"{CLR}{RVS} INSERT
       DISK TO CONTAIN NEW SP
      EEDCOLUMNS":POKE198,0
DA 110 GETK$:IFK$=""THEN110
RF 120 PRINT#15,"S0:NEW SC":OP
      EN1,8,1,"0:NEW SC,P,W"
RA 130 PRINT"{CLR}WRITING...":
      FORB=8193TO12065:PRINT#
      1,CHR$(PEEK(B));:PRINT"
      {HOME}{DOWN}"B:NEXT
XX 140 CLOSE1:INPUT#15,A,B$,C,
      D:PRINTA;B$;C;D:CLOSE15
      :END
AM 150 POKE8193+A,B:PRINT"
      {HOME}{DOWN}"8193+A:A=A
      +1:RETURN
SC 160 DATA 201,31,208,3,169,1
      3,96,133,2,41
CX 170 DATA 63,6,2,36,2,16,2,9
      ,128,112,2
KK 180 DATA 9,64,96
```

Speed Columns' ASCII conversion routine is slightly different from the one in *SpeedScript* and apparently doesn't work with some printers. The correction program loads Speed Columns and substitutes *SpeedScript*'s conversion routine for the one in Speed Columns.

● "Font Grabber" ("The GEOS Column," November 1988) doesn't handle full 8 × 8 character sets correctly. It converts the top seven rows of the font correctly, but the bottom row of pixels is set to 0. At this writing, we're still working on a solution. We'll publish a correction in this column as soon as we can.

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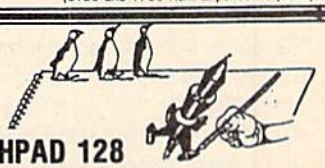

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Binary/Hex Enhancer

Sanjoy Dasgupta

This short, relocatable utility is a handy addition to the toolbox of any BASIC programmer.

When it comes to numbers, computers and people just don't think alike. While we use the decimal number system (base 10, digits 0–9), computers are more comfortable with binary (base 2, digits 0–1). Hexadecimal mode (base 16, digits 0–F) is a compromise between the two—it's easy for humans to read, and it's easy for computers to translate into binary.

"Binary/Hex Enhancer" gives you the freedom to use all three of these systems in your BASIC programs—decimal, binary, and hexadecimal (also called *hex*) notation. It's easy to use: Once it has been installed, just precede binary numbers with the % symbol and hex numbers with the $ symbol.

Getting Started

To use Binary/Hex Enhancer, carefully type in the program and save it to tape or disk. To use the program, simply load it and type RUN. You'll see the message "POKING ML DATA AT XXXXX . . ." (where *xxxxx* is the address at which Binary/Hex Enhancer is being installed).

Binary and hex numbers are very useful when you're accessing the 64's memory locations. Hex numbers are helpful because they are easy to remember, and binary numbers make bitwise operations easier to read. For example, to read the status of the fire button of the joystick in port 2, you must read the contents of bit 4 at location 56320 ($DC00). In normal BASIC, the required expression is

```
PEEK(56320) AND 16
```

With Binary/Hex Enhancer, you can use

```
PEEK($DC00) AND %00010000
```

You can use binary and hex numbers in any BASIC numerical expression or as arguments for BASIC functions. You may not, however, use them in DATA statements. The binary and hex numbers must be integers in the range 0–65535. All numbers outside this range will forced into it—only the leftmost 4 digits of a hex number or the leftmost 16 digits of a binary number will be used. The value must also be an integer, or you'll get a syntax error.

How It Works

Binary/Hex Enhancer automatically relocates to the top of the BASIC workspace, then lowers the top-of-BASIC pointer to protect itself. Since it is self-relocating and generally well behaved, it should be compatible with almost any program.

The routine works by changing the EVAL vector ($030A–$030B), which BASIC jumps to during expression evaluation. It checks the next character for a $ or a %. If either is found, the binary or hex number is read and converted into a floating-point number in FAC1. If neither is found, control is returned to the normal evaluation routine.

See program listing on page 92.

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64 RUNNER

Joel M. Rubin

The 1571 disk drive has something the 1541 doesn't—speed. When connected to a Commodore 128, it uses a special burst mode to load and save programs many times faster than a 1541 does. The problem is that the 1571 emulates a 1541 when the 128 is in 64 mode.

"64 Runner" to the rescue. Now you can load 64-mode BASIC programs with the high-speed burst mode. Once the program has loaded, 64 Runner switches your 128 to 64 mode and runs the program for you.

Take advantage of the 1571's burst mode to load BASIC programs lightning-fast in 64 mode. For the 128 only.

Typing It In

"64 Runner" is written in machine language. To type the program in, you'll need a copy of "128 MLX," the machine language entry program found elsewhere in this issue. When 128 MLX prompts you, respond with the values given below.

Starting address: 1C01
Ending address: 1D48

After you've typed in the program, save a copy to disk before leaving 128 MLX. Even though it's written in machine language, 64 Runner loads and runs like a normal BASIC program.

Full Speed Ahead

Once you've saved a copy of 64 Runner, you can use it to load 64 BASIC programs from 128 mode. Switch to 40 columns; then load and run 64 Runner. You will be prompted for the program name, disk device number, and drive number. 64 Runner defaults to device 8, drive 0. Press RETURN to accept the default device and drive, or enter new values to load from another drive. 64 Runner loads your program, switches your 128 to 64 mode, and runs the program.

64 Runner does not stay resident in your computer's memory. To use it to load another program, switch back to 128 mode by pressing the reset switch (or by turning the computer off and back on) and then run 64 Runner again.

How It Works

The 128 uses memory bank 0 when it's in 64 mode. Several important 128 vectors begin at location 2560 in bank 0—right in the middle of 64 BASIC memory. Therefore, if you try to BLOAD a 64 program to 2049 in bank 0, you'll probably crash your 128. You could, of course, BLOAD it somewhere else and then move it. However, 64 Runner was designed to use a better method: BLOAD the program to 2049 in bank 1 and then set the 128 to 64 mode using bank 1.

First, the machine code to load the program and set up 64 mode is moved to 49152 ($C000) in bank 1. (A 16K block is temporarily set up so the program can be moved easily without using the Kernal interbank routine INDSTA.) The ending address of the BASIC program is also saved (BASIC 2.0 starts storing variables in the middle of the BASIC text if you're not careful with this address). Next, a more-or-less normal GO64 is executed, but to bank 1 instead of bank 0. The input and output chips are switched in and all common RAM is switched out; then the VIC chip is told to look at bank 1.

Finally, when 64 Runner switches the 128 to 64 mode, it executes the normal 64 startup sequence. It relinks the BASIC program, restores the top-of-program addresses, and runs the program.

See program listing on page 81.

1581 Alphabetizer

Raymond D. Layton

The 1581 can store 4½ times as much information on a disk as a 1541 can. Each disk can hold almost 300 files. This additional storage space can be quite a boon. But it also introduces a problem: When you have so many files, it's hard to find the one that you want in a directory listing. If you have disks containing hundreds of files, then "1581 Alphabetizer" is for you.

Several utilities are available that allow you to reorganize the directories of your 1541 or 1571 disks, but until now, there haven't been any similar utilities for the 1581. With 1581 Alphabetizer, you can alphabetize the directories of your 3½-inch disks. If you think up a better way to organize the files, 1581 Alphabetizer will let you rearrange the files as you like.

Typing It In

1581 Alphabetizer is written in BASIC and may be entered on either the 64 or the 128. Be sure to use "The Automatic Proofreader," found elsewhere in this issue, when entering the program. Since 1581 Alphabetizer writes directly to your disks, if you make a typing error in entering it, it could scramble the directory of your disk. Until you are sure that you have entered it correctly, test it on unimportant disks.

To get started, load and run 1581 Alphabetizer. First, the program prompts you for the drive number. Enter the device number of your 1581 or press RETURN to default to drive number 8. Next, Alphabetizer checks the disk drive to see whether it is a 1581. This step is important because if you were to treat a disk formatted on a 1571 as if it were a 3½-inch disk, important data could be lost. If the drive you've selected isn't a 1581, the program warns you and waits for a keypress before trying again.

Bring order to the chaotic directory listings of your 3½-inch disks with this short BASIC utility for the 64 and 128.

Once the program is satisfied that the selected drive is a 1581, it waits for you to press a key before it reads the disk directory. Place your disk in the drive and press any key; 1581 Alphabetizer begins to scan the disk for directory entries. Each entry is stored in alphabetical order as it is read from the disk. Each time it finishes storing a directory entry, 1581 Alphabetizer prints a dot on the screen.

The program displays the alphabetized directory when all the entries have been read. Next, it gives you the chance to edit the order of the files. If you enter *Y* at the prompt, 1581 Alphabetizer enters edit mode. If you don't want to change the order of the files, press the N key.

Changing the Order

In edit mode, 1581 Alphabetizer shows as many as 24 files on the screen at a time. If the disk contains more than 24 files, pressing + will step forward through the files one screen at a time. Press − to step backward through the files. At the top of the screen, you'll see the red edit cursor. You may move the cursor with the up- and down-cursor keys.

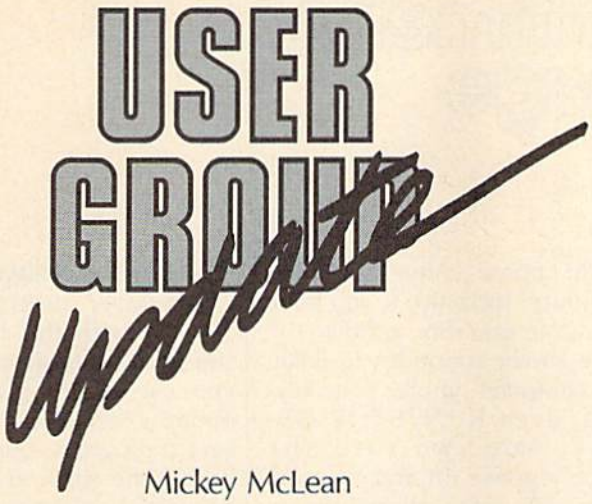
To move a file to a new position, move the edit cursor to the file and press P (pick up). The file you pick up is removed from the list, the files below it are moved up to fill the space, and the edit cursor is shown in reverse video. Move the edit cursor to the new position for the file and press P again. The file under the cursor and the ones below it are moved down, the file you picked up is placed in the vacated space, and the edit cursor returns to normal.

You may rearrange the files in the directory into any order you wish. When you're satisfied with the order, press Q to exit edit mode. Note that you're not allowed to exit edit mode if you have picked up a file without putting it down.

Save It?

Once the directory is in order, 1581 Alphabetizer asks whether you would like to save the new directory. Up until this point, everything you've done has been carried out in memory. If you want to leave the directory unchanged, press N. Press Y to write the new directory and validate the disk. Next, 1581 Alphabetizer asks if you would like to alphabetize another directory. Press Y to rerun the program.

See program listing on page 86.



Mickey McLean

The following list includes updated entries to our annual "Guide to Commodore User Groups," which last appeared in the May and June 1988 issues.

Send typed additions, corrections, and deletions for this list to

Commodore 64/128 User Group Update
COMPUTE!'s Gazette
P.O. Box 5406
Greensboro, NC 27403

When writing to a user group for information, please remember to enclose a self-addressed envelope with postage that is appropriate for the country to which you're writing.

User Group Notes

The **West Orange County Commodore Users Group** in Huntington Beach, California, has changed its name to the **Coastline Commodore Club.** Its mailing address is 20311 Ravenwood Lane, Huntington Beach, California 92646.

The **Multi-User Computer Club** (213 Holly Avenue, South Pittsburg, Tennessee 37380) now has a 24-hour bulletin board service. Its phone number is (615) 837-8352.

TPUG Inc. has changed its address. All correspondence should be sent to 5334 Yonge Street, Suite 116, Willowdale, Ontario, Canada M2N 6M2.

New Listings

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Marysville-Yuba City Hub Area Commodore Club (HACC), 7127 Arrowhead Trail, Browns Valley, CA 95918-9630

INDIANA

Richmond Area Computer Users Group (RACUG), P.O. Box 1332, Richmond, IN 47375 (BBS# 317-935-1256)

MASSACHUSETTS

North Worcester County Commodore User's Group, 208 Clark St., Gardner, MA 01440

NEW HAMPSHIRE

New England Computer Pioneers, P.O. Box 815, Contoocook, NH 03229

NEW MEXICO

Commodore Programmers Unlimited (CPU), 2310 Teodoro NW, Albuquerque, NM 87107

VIRGINIA

Middle Peninsula Commodore Users Group (M.P.C.U.G.), P.O. Box 1256, Gloucester Point, VA 23064 (BBS# 804-642-0871)

Outside the U.S.

CANADA

C.O.B.L.I., 911 Place Pilon, Ste.-Thérèse, Quebec, Canada J7E 4R3

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* Single disks for *COMPUTE!*, *Gazette*, or *Apple Applications* are $15.00. NOTE: No disks dated prior to June 1986 are available.
* Back issues of *COMPUTE!'s PC Magazine* are $16.00 each and back issues of *Atari ST Disk & Magazine* are $8.00 each. (These publications are available only as magazine/disk combinations.) The following issues are **NOT** available: ***PC Magazine:*** 9/87, 11/87. ***Atari ST Disk & Magazine:*** 10/86.
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the programmer's page

Randy Thompson
Contributing Editor

"The Programmer's Page" is interested in your programming tips and tricks. Send all submissions to The Programmer's Page, **COMPUTE!'s Gazette,** *P.O. Box 5406, Greensboro, North Carolina 27403. We'll pay $25–$50 for each tip we publish.*

Computers are perfect; they never make mistakes. Right? Wrong. Computers are prone to all types of errors. True, it's usually our fault when a computer errs—we forget to initialize an important variable or, worse yet, POKE a number into the wrong memory location. But every once in a while, the problem is caused by bugs in the computer's operating system.

By searching through COMPUTE!'s information archives (by flipping through past issues of *Gazette*, that is), I've compiled a list of some of Commodore's more infamous bugs. As a programmer, you need to know which bugs infest your computer. If you know what the bugs are, then you'll know how to work around them. You'll also know when to blame your computer, not yourself, when something goes wrong.

64 Lockup

This is one of deadliest bugs around. It's also one of the most widely known, although you won't find it in newer 64s, the 64c, or the 64 that's hidden within the 128.

To see if your 64 has the lockup bug, turn on your 64, move the cursor down to the last line, and hold down the space bar until the cursor passes the right edge of the screen twice. Hold down the DEL key until the cursor goes back to the far right column. If you own a 64 with the lockup bug, the words LOAD, ?SYNTAX ERROR, READY, and RUN appear on the screen and the computer locks up. If you have a program in memory, it runs.

The cursor continues to flash, but the computer ignores your keypresses, even RUN/STOP–RESTORE. You can turn the computer's power off and then on, but this will erase everything in memory. If you own a Datassette, you can defeat the bug by simultaneously pressing the left SHIFT key and 3, or X and 5, or V and 7, and so on (every other key from left to right). The screen will display PRESS PLAY ON TAPE. Press PLAY on the Datassette and then RUN/STOP. Your computer will return to normal. Disk drive owners can avoid the bug if the first line in the program in memory is OPEN 15,8,15:INPUT#15,S$:CLOSE 15.

The lockup bug will occur only when the cursor color is red, cyan, blue, yellow, light red, dark gray, light blue, or light gray. Safe colors are black, white, purple, green, orange, brown, medium gray, and light green. To avoid the problem altogether, change the cursor to a safe color before you start to program.

No Capital Q

Most 128 owners are familiar with this little keyboard quirk. Activating the CAPS LOCK key that appears on the top row of the keyboard causes all typed characters except the *Q* to appear in uppercase. This is caused by an incorrect value in the 128's keyboard lookup table.

To enter an uppercase *Q*, you have to hold down the SHIFT key or press SHIFT LOCK. You can fix this bug by running the following one-line program:

```
10 FORI=0TO88:POKE6912+I,PEEK(
   64484+I):NEXT:POKE6974,209:
   POKE840,0:POKE841,27
```

This bug does not occur on the 128D.

Save-with-Replace

Commodore computers have been plagued with this bug for a long time. The problem occurs when you use DOS's save-with-replace option—SAVE "@:*filename*",8—to save a program. Depending on the day of the week, the current location of the stars, and how much coffee you've had, your file may or may not be saved properly.

Actually, Commodore's save-with-replace bug is the fault of its disk drives, not its computers or your caffeine consumption. The "Feedback" column in the October 1985 issue provides a good explanation of this bug which bears repeating here.

Save-with-replace does several things. First, the new copy of your program is saved (if there's not enough room on the disk for a complete copy of the program, you'll have problems, of course). Each filename in the directory contains a pointer that indicates where you can find the program, so the directory is changed to point to the new version of the replaced program. Finally, the block allocation map (BAM) is updated. Disk sectors used by the old version are marked as free, while the sectors occupied by the new version are marked as allocated. The routine to update the BAM is where the bug happens.

In certain situations, the BAM is incorrectly written back to the disk. Right after a faulty save-with-replace, the program name is in the directory, the pointer to the program is correct, and the new version is on the disk. You can load the program and even verify it. But the blocks used by the program are not allocated. The next time you save a program, it may be put into those blocks, and your previous (replaced) program is gone and cannot be recovered. If you load the directory, the number of blocks used by the program plus the number of free blocks should total 664. When

the bug happens, the total is often more than 664.

The roots of the problem go back to the PET dual drives (drives 0: and 1:). The disk operating system (DOS) of the 1541 and 1571, two single drives, was translated and modified from the original dual-drive DOS. So there's a sort of "phantom" drive 1 in the 1541 and 1571. One expert on Commodore DOS has said the 1541 spends half its time convincing itself that it's drive 0 and not drive 1. Sometimes the 1541 mistakenly sets aside a buffer for the phantom drive, which can, under certain circumstances, lead to the save-with-replace bug.

There are three ways to avoid the bug and safely use save-with-replace. First, you can validate the disk after every save-with-replace. This isn't such a good solution because it often takes more time than scratching the old version and doing a regular save.

The second solution is to *always* use the 0 prefix when you use the disk. Here are some examples:

```
LOAD "0:FILENAME",8
LOAD "$0:",8
SAVE "0:FILENAME",8
OPEN 15,8,15,"I0"
```

The third solution is to turn the disk drive off and then on right before a save-with-replace—and be sure to include a 0 (**SAVE "@0:*filename*",8**). Another way to reset the disk drive is to enter these two lines (they should be on separate lines; don't put them on a single line with a colon between them):

```
OPEN 15,8,15,"UJ0"
CLOSE 15
```

DEF FN and GRAPHIC 1,1

The 128's DEF FN command allows you to define your own mathematical functions. This feature can be very handy when you're writing graphics programs that make use of several complex calculations. You must be careful when doing so, however. If you execute a GRAPHIC 1,1 (or 2,1 or 3,1 or 4,1) *after* a DEF FN statement, you'll get a syntax error when the function is accessed. This happens only when the program is run for the first time. The second time you run the program, DEF FN works fine.

When functions are defined, the function name is stored in variable memory with a pointer that refers to the function's equation in the BASIC program. To make room for the hi-res screen, the GRAPHIC command moves the BASIC program up in memory by 9K. Unfortunately, function pointers are not updated; they still point to where the equation *used* to be.

To avoid this bug, add the commands **GRAPHIC 1:GRAPHIC 0** before any functions are defined.

CMD Bugs

CMD (Change Main Device) is BASIC's most bug-ridden command. Normally, CMD redirects output to the device of your choice. For example, after an

```
OPEN 4,4:CMD 4
```

has been executed, all output from commands such as LIST and PRINT will be sent to the printer (device number 4).

CMD is easily disabled, however. GET, PRINT#, and sometimes GOSUB will redirect output to the screen. Interestingly enough, CLOSE does *not* disable CMD. If you neglect to redirect output to the screen before performing a CLOSE, output will continue to be sent to the CMD device. That's why programming books tell you to terminate a CMD 4 with PRINT#4:CLOSE 4. The PRINT#4 command flushes the printer's line buffer and resets the output device to the screen.

6502 Bug

Sometimes a computer's problems stem from its microprocessor and not its operating system. That's the case with the machine language indirect JMP instruction found on the 64 and 128. This bug in the 6502 and 6510 chip affects not only the 64 and 128, but the VIC, Plus/4, 16, 8-bit Ataris, Apple IIs, and any other computer built around the 6502 family of microprocessors.

JMP is the machine language equivalent of BASIC's GOTO command. JMP $C000, for example, instructs the microprocessor to execute the instructions found in memory at $C000. An *indirect* JMP is a bit different. Its syntax looks like this: JMP ($C000). Instead of jumping to location $C000, this instruction jumps to the location *pointed to* by $C000 and $C001. If memory locations $C000 and $C001 contain a $01 and a $08 respectively (the address's low byte and high byte), JMP ($C000) will execute the machine language routine located at $0801.

Here's the bug: If the low byte of the JMP address is $FF, as in JMP ($C0FF), the JMP instruction will take the address's low byte from $C0FF and the high byte from $C000—*not* $C100, as it should.

The best way to avoid this bug is simply not to use the indirect JMP instruction.

1571 Bugs

There are several bugs in the earlier 1571 disk drives. Here's a list of the more notable ones:

- Save-with-replace still doesn't work properly.
- The DEVICE NOT PRESENT error occurs after a file has been accessed repeatedly in 1571 mode. You can prevent this by entering 1541 mode prior to any disk access. To switch to 1541 mode, enter the command **OPEN 15,8,15,"U0>M0"** followed by **CLOSE 15**.
- In 1571 mode, locked files (marked with a less-than sign) will not load. They will load if the drive is in 1541 mode.
- If you validate a double-sided disk when the 1571 is in 1541 mode, it changes a byte on the disk to mark it as single-sided. If this happens to you, you can change your disk back into a double-sider with the following program:

```
10 OPEN 15,8,15:OPEN 2,8,2,"#"
20 PRINT#15,"LU1";2;0;18;0
30 PRINT#15,"B-P";2;3
40 PRINT#2,CHR$(128);
50 PRINT#15,"U2";2;0;18;0
60 CLOSE 2:PRINT#15,"I0":CLOSE
   15
```

The best way to fix these bugs is to see a Commodore dealer and upgrade your 1571 with the new ROMs. To see if your 1571 needs this upgrade, boot your computer; then enter and run the following program:

```
10 OPEN 15,8,15,"UI":INPUT#15,
   A$,B$:CLOSE15:PRINT B$
```

If you have the old ROMs, you'll see a message with *DOS v3.0* in it. The newer ROMs return a DOS number of 3.1.

BASIC for beginners

DEF FN and FN

Larry Cotton

In November, we reviewed variables for a specific purpose: to prepare us for a new BASIC statement—DEF FN—and a new BASIC function—FN.

The new statement and function are always used together to create what the *Commodore 64 Programmer's Reference Guide* calls *user-defined functions*. In this context, the user is *you*, the BASIC programmer, not the user of the program itself.

The functions themselves are usually arithmetic functions—written as formulas or equations. (See "The Programmer's Page," page 59, in the August 1988 *Gazette* for a notable exception.) They can be as simple as A + B but are generally more complicated mathematical expressions. Since we've covered the four basic math functions, we'll limit our examples of DEF FN and FN to these operations plus the RND function.

Substitute for Subroutine

Have you ever written a program where a certain mathematical formula was used repeatedly? Used in tandem, DEF FN and FN save you from having to type the same formula over and over, and in a sense, they are a substitute for a subroutine.

DEF FN defines the function; it must appear in a program before FN, which executes the function. Here's a simple example:

```
10 A=4: B=5
20 DEF FN Z(X)=A+B
30 PRINT FN Z(X)
```

Line 10 assigns numeric values to the constants A and B. Line 20 names and defines the function Z (don't worry about the letter in the parentheses yet), which is a simple addition problem.

Finally, in line 30, function Z is executed and the results are printed to the screen. What's displayed is the sum of A and B, or 9.

Naming Functions

In the example above, Z is the name of the function. Functions can be named with any legitimate floating-point numeric variable name—A3, XX, SURFACE, and so on. This name follows the standard rules for constant or variable naming, as covered in November's column. When you assign function names, try to use short, meaningful names. Make sure they don't contain BASIC keywords; TOPAZ (with the BASIC keyword *TO*) or DIAMOND (with the BASIC keyword *ON*) won't work.

Note that we're talking about *floating-point numeric variable* names only—not integer numerics or strings. But whatever name you choose for the function in your program, you must repeat the same name after FN. For instance, this won't work:

```
10 T=15: U=20
20 DEF FN Z(X)=U-T
30 PRINT FN A(X)
```

If you try to run this one, you'll get an UNDEFINED FUNCTION ERROR IN 30—function A has not been defined. Also, note that the function's name has nothing to do with the names of the constants or variables used in the formula.

Arguments

Now for the letter in the parentheses. It's called the *argument* of the function. An argument must appear after the function's name in both DEF FN and FN. However, unlike the function name, the two arguments don't have to be the same. But the argument you choose can affect the outcome of the formula. Enter this simple program:

```
10 A=5: B=6: C=7
20 DEF FN X(Q)=A+B
30 PRINT FN X(Q)
40 PRINT
50 DEF FN X(Q)=Q+20
60 PRINT FN X(C)
70 PRINT
80 PRINT FN X(Q)
```

When you run it, three numbers print to the screen—11, 27, and 20. Here's why: Lines 10–30 are similar to what we've already seen. Note that argument Q in the parentheses does *not* appear on the right side of the equal sign. Therefore, line 30 just prints out the value of the function itself—A + B, or 11.

Since Q isn't part of the formula, it's called a *dummy argument*. Strangely enough, you could use just about any numbers or letters for Q in line 30 and get the same result. Try a few.

However, lines 50 and 60 are another matter altogether. Line 50 defines a new function X, with an argument that *does* appear on the right side of the equation. When the FN statement in line 60 executes, it substitutes the value of C for Q in the formula in line 50.

Put another way, lines 50 and 60 say *Everywhere there's a Q in the formula, plug in a C instead.* Thus, when line 60 says to print the function using C as the argument, C + 20 (7 + 20 = 27) gets printed instead of Q + 20.

Line 80 illustrates what happens if Q is used as the argument after FN. Since Q's value is 0 (all constants and variables are 0 when a program is first run), Q + 20 = 20.

Numbers in FN Function

Type NEW to clear the last program and enter another example which uses actual values (not constants) as arguments in the DEF FN statements:

```
10 H=63: K=72
20 DEF FN X(G)=G+12*3-H+K
30 PRINT FN X(20)
40 PRINT FN X(30)
```

When you run this one, you should see the values 65 and 75 printed on the screen. Why? Line 20 names and defines the function X. The argument of the DEF FN state-

ment, G, occurs to the right of the equal sign in the equation. Line 30 says that wherever G is encountered in the program, 20 should be plugged in instead.

My Dear Aunt Sally (Multiply, Divide, Add, Subtract) says to first multiply the 12 by the 3 to get 36, then add G (which is now 20) to get 56, add K (which was defined in line 10 as 72) to get 128, then subtract H (defined in line 10 as 63) to get 65.

Line 40 does the same thing, but substitutes 30 for G. This gives an answer of 75.

DEF FN and FN with RND

Here's another, possibly more interesting, example that uses DEF FN and FN with RND:

```
10 L=100: U=200
20 DEF FN A(X)=INT(RND(1)*(U-L
   +1))+L
30 PRINT FN A(X)
40 GOTO 30
```

This program generates a series of random numbers in the range 100–200, inclusive. We set our upper and lower limits in line 10, then define a function (named A) as a standard random number-generating formula. (For a closer look at the RND function, see "BASIC for Beginners" in the February and March 1988 issues.)

Lines 30 and 40 loop to print the continuous stream of random numbers. Line 20 needs to be run only once. Note that X in this program is a dummy argument—it's not used in the formula itself.

Run this program once more and stop it with RUN/STOP. Then, in immediate mode, type

```
PRINT FN A(X)
```

You should see another random number printed in your chosen range. You can do this as often as you wish, demonstrating that FN also works from immediate mode.

However, DEF FN must be preceded by a line number and run once to execute.

You may even change the upper and lower limits without having to define the function again:

```
10 L=100: U=200
20 DEF FN A(X)=INT(RND(1)*(U-L
   +1))+L
30 PRINT FN A(X)
40 U=U-1:L=L+1
50 IF U=L THEN END
60 GOTO 30
```

Line 40 decrements the upper limit while incrementing the lower limit. This places the random number that's generated in an increasingly narrow range.

There is a strange phenomenon worth noting which sometimes occurs when you're using DEF FN and FN. List line 20 again and remove the last parenthesis:

```
20 DEF FN A(X)=INT(RND(1)*(U-L
   +1)+L
```

You have just created what would normally be a syntax error.

Now run the program with this change and observe the results: You get a syntax error in line 30! But line 30 doesn't have the syntax error—line 20 does.

So what's happening here? As it turns out, DEF FN doesn't care what you put after it. You could type DEF FN A(X)= %#$('& \#$ and the syntax error would still pop up in line 30.

Only when the FN function is executed is the syntax error detected. Remember: When you get a syntax error in a line that contains FN, look back at your DEF FN statement to find the source of the error.

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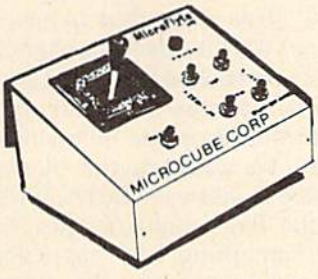

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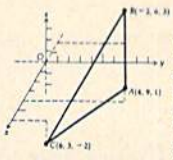

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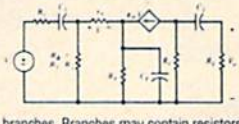

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machine language programming

Same Game, But Faster!

Jim Butterfield

I sometimes get queries about how to do something in machine language (ML) that the user knows how to do quite well in BASIC. Often the answer is to do it the same way you do it in BASIC.

A simple example will illustrate. In BASIC, we set the border color to black with POKE 53280,0. In ML, we would do the job exactly the same way:

```
LDA  #$00
STA  $D020
```

Sometimes I wonder if the sophisticated BASIC of the 128 doesn't hamper users when they begin using ML. A 128 user might set the border to black with COLOR 4,1. The transition to ML must be more difficult in this case.

You usually tackle the same job in BASIC in a similar way in ML. But sometimes ML is too fast. For instance, if you were to write POKE 53280,0:POKE 53280,14 in BASIC, you'd see the border flick to the new color and back. But the equivalent ML code

```
LDA  #$00
STA  $D020
LDA  #$0E
STA  $D020
```

would be invisible. It's not only too fast for your eyes, it's also too fast for the screen itself.

It's often necessary to slow down ML events to make them perceptible. Let's explore a useful video slowdown technique.

Raster Control

The video screen is being drawn continuously; a beam of electrons called a *raster* sweeps across the screen 60 times a second. There is a brief time between sweeps known as the *retrace*. Here's the key: Certain types of screen effects are best done during this retrace period. It helps avoid the effect of screen flicker or tearing.

How do we detect when we're in this brief retrace period? We could watch the raster register—$D012 and the high bit of $D011—which changes as the screen is swept. When the number is low, we have just started the retrace.

But it requires careful coding to establish when this number is in exactly the right value range. We wouldn't want to catch the same retrace twice or to miss it altogether.

A better way: We could have the video chip tell us when the raster passes a certain spot on the screen. When that occurs, the chip sets a flag in $D019 (bit 0). We watch for this flag, and, when detected, turn it off and do our video job.

Note that this flag is *not* an interrupt. It's a memory location that says, "This event has happened!" We can reset it, check it, or ignore it.

If we wished, we could ask this flag to become an interrupt (we won't do this in the following program). We would do this by storing a value in address $D01A. If we did so, the flag would not just signal that something had happened, it also would interrupt the processor with an IRQ signal, and we'd need code to deal with this interrupt. But time isn't critical here. We won't energize the interrupt; we'll just look at the flag from time to time.

The following program, which runs on the 64 or 128 (40 columns), does something very simple: For 16 cycles, we switch the border color every time we go through the retrace. Sixteen multiplied by 1/60 second is about 1/4 second. But that's enough time to see the flash. And we'll have the satisfaction of knowing that we're switching the screen in a clean way at the time of the retrace.

First, the program sets the value of the raster count at which it wants to be notified. We'll use a value of 16 ($10). If we used a large enough value, we would be notified while the raster was on the screen where we could see it. A smaller value would be fine, but we're well up into the border area in any case. Because one bit of the raster register is in $D011, we'll need to do an AND operation to set that to 0.

```
2000 LDA  #$10
     STA  $D012 (16 to raster register)
     LDA  $D011
     AND  #$7F  (zero high bit)
     STA  $D011
```

We store a value of 1 in register A (the Accumulator). This value will remain there for the rest of the program. It's quite important, since it's used (in conjunction with the BIT command) to test and then to clear the flag. We clear the flag initially, too:

```
     LDA  #$01
     STA  $D019 (reset flag)
```

The above coding is strange. We set the $D019 flag to 0 by storing a value of 1 there! You need to read the technical specifications carefully to identify the idiosyncrasies of I/O chips.

```
     LDX  #$00
```

X will count the 16 cycles of color. Test the flag with the BIT command (a 1 in $D019) and wait if the flag isn't set.

```
2014 BIT  $D019 (test flag)
     BEQ  $2014
```

The flag is detected! Reset it by the same curious method of storing 1 there.

```
     STA  $D019 (reset flag)
```

Bump the color. Bump the count. Go back and do it again if necessary.

```
     INC  $D020 (border color)
     INX
     CPX  #$10
     BNE  $2014
     RTS
```

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Ad G4W

That Masked Man

Rhett Anderson

Let's imagine a time when the 64 is a distant memory and the 128 and Amiga have come and gone. There's a new computer rocketing up the Christmas sales list—the Commodore Take-Three.

What's special about the Take-Three? As you may guess, it's packed with terabytes upon terabytes of fast RAM (a terabyte is a trillion bytes). It has several RISC microprocessors. It can emulate (at full speed) the Commodore 64 and the Amiga 500. It does realtime ray-traced graphics and realtime fractal-image compression. Its display has millions of colors. It has stereo sound. It has an optical disc drive.

What else? How do we interact with the Take-Three? Does it still have a keyboard? Or something new and exciting? To get a clue, we have to figure out what the masked man from NASA was doing.

Who Was He?

Last summer, a press photo from NASA made its way into several science magazines. Looking like some alien mime, the man wore special gloves and a space-age visor. His hands were in front of him and he stared intently forward.

It looked as though he was grasping at something that only he could see. And that's exactly what was happening. A computer was creating a stereoscopic image and projecting it into the visor. To interact with this new computer-created environment, the man simply had to wave, twist, and otherwise move his hands. Special sensors in the gloves picked up the motions and transmitted them to the computer.

The masked man was demonstrating a crude form of tomorrow's computer interface.

The Take-Three

Now imagine that you've brought Commodore's latest hit computer home for Christmas. When you open the box, you find the system unit, a keyboard (about the most efficient text-entry device we can imagine), a monitor, a mouse, an optical drive, and two Commodore Datasuits—descendants of the outfit the masked man wore.

The Take-Three is bundled with an integrated productivity package (word processor, database, spreadsheet, and the like), the Commodore Reference Library (dozens of reference books on a single CD-ROM), three games (Bowling, Space Bubbles, and Pac-Man 3-D), two educational packages (Voyage Inside the Body and The Signing of the Declaration of Independence), and two interactive movies (A Spy in Germany and Raiders of the Aztec Ruins.)

You plug in the computer, the keyboard, the monitor, and the drive. The system boots up with a stunning five-second graphic showing the Commodore Take-Three logo spinning around the globe. Then you see the READY prompt. You are in the Take-Three control language—a powerful superset of the BASIC language.

You insert the productivity package into the optical drive. A click of the mouse sends you into demo mode, where a spreadsheet is created. You choose GRAPH IT, and a spectacular graph of the data is created.

It's time to try out the Datasuit. You and a friend put on the special goggles, the gloves, the sensor-laden elbow- and knee-pads, and the special overshoes. Stereo headphones complete the outfits.

You see the same graph you saw before, but, amazingly, you now see it in 3-D. You can also see a humanoid stick figure—your friend—with Mickey Mouse–style gloves. You raise your hand and you can see it, too. You point at a piece of data. You press it down and see how it affects the other numbers.

The Way to Play

Ready for a new challenge, you pop Pac-Man 3-D into the drive. You are in a realistic maze with low walls. You can see the monsters, and they can see you. You must pick up all the dots (which look like floating rubber balls) without being caught by the monsters. Four Power Pills shine and flicker like gas lamps. Run into one and you can send the monsters back to their homes. Of course, you can't walk too far without bumping into the (real-world) wall, so the game lets you substitute a gentle bending motion of the knees for walking.

Now try Bowling. Pick up the ball and throw it down the alley. Crack! A strike!

The educational programs are fascinating. Consider Voyage Inside the Body, for example. You shrink to microbe size and travel through the body for a new perspective of anatomy. Just what does it feel like to be a blood corpuscle shooting through the heart?

You eat Christmas breakfast thinking about what you have experienced. With your camcorder, you'll be able to design your own interactive programs.

After a short break, you witness the signing of the Declaration of Independence.

That Masked Man

Before packing up to travel to Grandma's house, you and your friend try out one of the interactive movies, Raiders of the Aztec Ruins. You're about to be sacrificed, but your friend saves you just in time.

The Take-Three may be a while in coming, but it will be here someday. And the best way to get ready for that day is to keep computing.

Teachers and Technology in the 1990s

Fred D'Ignazio

We are now entering an era in which the role of the teacher—as expert, authority figure, and dispenser of learning—is about to change. New models for teachers are being suggested, including leader, visionary, scout, and champion. Teachers themselves are looking for change which improves the quality of their working environment, makes them more successful in teaching their students, and elevates their status in the eyes of their community and the educational establishment.

A Multimedia Curriculum

Technology itself will soon offer teachers an opportunity for change by redefining the curriculum which they are required to teach. Over the next decade, curricular knowledge will be transformed as the publishing, broadcasting, and communication fields converge toward a common digital standard. Knowledge "carriers" which once were quite separate—radio and TV; motion pictures; telecommunications; book, magazine, and newspaper publishing; data processing; and the performing arts—will converge and overlap. Out of this will emerge new hybrid representations of curricular knowledge—through multimedia publishing, multimedia computing, and so on.

At the same time, new multimedia communication tools will become available to individuals as new tools for personal communication. The meaning of *desktop publishing* will extend to include creating "documents" that combine photographic images, human voices, music, sound effects, full-motion video, and computer graphics, as well as words and numbers.

New multimedia knowledge-communication devices will eventually shrink in size and price to the point where they fit on a desktop and become affordable for classroom learning. Teachers who embrace this technology at an early point will have the unique opportunity to become pioneers and explorers in a remarkable new learning environment in which students can reconstruct curricular knowledge in a multimedia format. Today's talk-and-text classroom communications environment will evolve into an exciting, studiolike arena in which student producers create curricular videos, electronic slide shows, video book reports, infographics, and multimedia term papers. Difficult, dry subjects will come alive as students translate them into multimedia presentations.

Scavenged Multimedia

Multimedia student publishing will one day become as normal a source of classroom curriculum materials as the worksheet or textbook. However, teachers who see the possibilities for student-produced, multimedia learning don't have to wait for some far-off future. They can begin now. They can bring the multimedia publishing environment of the 1990s into today's classroom by assembling the separate pieces of multimedia into a single multimedia learning center scavenged from equipment already found around most schools.

Teachers are ingenious improvisers and scavengers, and they can use these skills to work with their students and track down everything they need, including a computer, a VCR, a TV, a video camera, a tape recorder, a turntable, and an electronic keyboard.

Students as Producers

Students can lead the way in putting the different parts of the center together. In a multimedia center, electronic "toys" like video cameras, musical keyboards, boom boxes, and Walkmans can be linked together to become a multimedia publishing station capable of producing science radio shows, video biographies, multimedia science projects, electronic field trips, and all sorts of other innovative and exciting presentations.

However, none of this will happen unless teachers are willing to share some of the responsibilities for teaching and learning with their students. They can do this in a multimedia learning environment in which everyone learns from each other. The teacher is a process specialist and a knowledge specialist. Children are especially handy around new technologies and at figuring out ingenious ways to explore critical subjects in the curriculum using these technologies. Teachers can play a leadership role with their students by collaborating with them as knowledge-explorer teams who translate textbook knowledge into new, exciting multimedia representations.

If teachers are going to succeed at preparing their students for the workplace of the 1990s, they must create an environment which resembles that workplace—and technology is only one ingredient of that environment. Teachers must also include opportunities for students to take responsibility for their own learning and become "producers" of their own knowledge. Students must have time to work together as collaborative teams and be put into situations where they can explore and muck around, where they must think critically and cooperatively in order to solve problems and accomplish tasks.

Such classrooms are true multimedia classrooms that model the work environment of the 1990s and in which teachers play a leadership role—in collaboration with their students.

Close-Up: *geoChart*

Robert Bixby

This new GEOS utility lets you quickly and easily draw professional-looking histograms, graphs, charts, and scattergrams.

geoChart, the latest addition to the GEOS family of programs, is a chart-drawing utility that can present data in nine different formats: area graph, bar and column graphs (histograms), pie chart, line graph, point graph (a line graph without the lines), scattergram with points, scattergram with lines, and unibar graph. Data for these charts can be imported in the form of text scraps from *geoWrite*, *geoFile*, *geoCalc*, or the new version of Note Pad (included with the *geoChart* package), which allows you to copy the current Note Pad page to a text scrap.

geoChart will work with GEOS versions 1.2, 1.3, and 2.0. It will work in 64 mode or in 40-column mode with GEOS128.

Because it works from text scraps, *geoChart* can work only with a single set of data at a time. However, you can use the text manager to save a number of data sets for charting.

As you can see from the figures that accompany this article, *geoChart* is capable of producing attractive, instantly understandable charts of information.

These charts can then be exported, this time as photo scraps, for inclusion in *geoWrite*, *geoPaint*, or *geoPublish* documents.

Each time you invoke *geoChart* to make a new chart, you are presented with a generic chart that shows what the program can do. It's time-consuming and of questionable value to have this essentially meaningless chart appear each time the program is run. It takes about 15 seconds to draw on the screen a column chart representing 1987 widget sales.

Widgets seem to be having a banner year. However, as a person who sees at least one widget chart or document a week, I tire easily, wilting visibly whenever the *W* word appears on the screen. (Is it too much to ask that software companies come up with another product to chart and write about? Isn't anyone keeping track of doohickey sales? Or my personal favorite, boohahs?)

If you open an existing chart (one you have created yourself), you'll avoid the widget chart.

Importing Data

You can create data for use with *geoChart* with a number of programs. I suspect that most people will prefer to use *geoWrite*, since this is one of the most familiar utilities. It would be just as simple to highlight an area of cells in *geoChart* and copy them with the Edit menu into a text scrap. And anyone who purchases *geoChart* will have a copy of the new Note Pad, which would be just as easy to use as *geoWrite*, with the additional advantage of being always available as a desk accessory, even from within *geoChart* itself. Copying the current page of the new Note Pad to a text scrap is as simple as pressing Commodore-C.

You can arrange data either by separating data elements by commas or (in *geoWrite*) with tabs. The first information entered in the upper left position of the text should be the title of the chart. This may be left blank, but in its place you must place a tab or comma to indicate that the series names are beginning. Figures 1, 2, and 4 are examples from a spreadsheet called Profits, and the series names are the months of the year. These should constitute the top row of your data.

Each of the subsequent rows should begin with a category name, such as Toys, Tools, and so on, as depicted in the accompanying charts.

After the category names, you should enter the values that correspond to the series names, such as January profits, February profits, and so on.

The values in the categories are necessary for using the text scrap in *geoChart*, but all of the text is optional. You can have a chart with no text in it at all, in other words.

An example of data to be used in *geoChart* might be quarterly investment losses:

```
Losses,First,Second,Third,Fourth
Industrial,6.50,3.20,1.00,1.20
Utilities,2.00,1.58,0.35,0.90
```

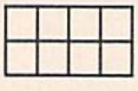
Or, if you are using *geoWrite*, you can insert tabs in place of the commas as follows:

Losses	First	Second	Third	Fourth
Industrial	6.50	3.20	1.00	1.20
Utilities	2.00	1.58	0.35	0.90

Data Mode

To import the text scrap as data for a chart, pull down the Edit menu and select Paste. You are instantly taken to Data mode, where you can work directly with the data to be used in the chart (as opposed to Chart mode, where you work with the actual chart, discussed below).

In Data mode, you see a grid, which resembles the following for the data given above:



As you move the pointer to the various cells of the grid, you see the category and series names that apply to the cell you are pointing to, as well as the value in the cell.

You must identify which is the series and which is the category for *geoChart*. You can have as many as 50 columns and 25 rows of information (or 51 columns and 26 rows, including chart title, category names, and series names). This

Figure 1. The default column chart.

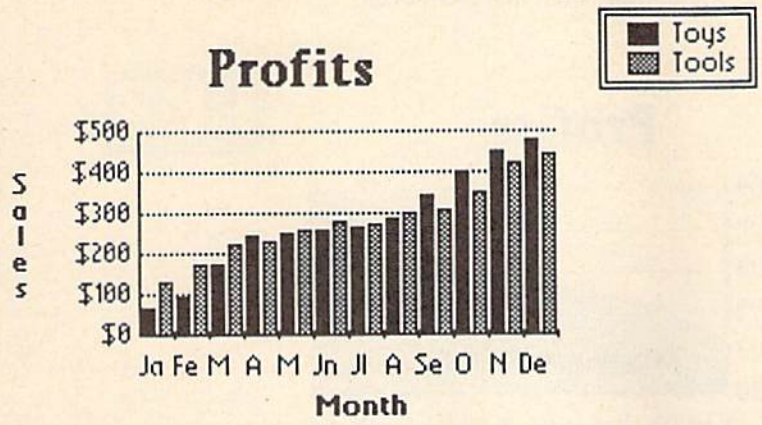


Figure 2. Charts can be exported to *geoPaint* and *geoWrite* in a slightly reduced form.

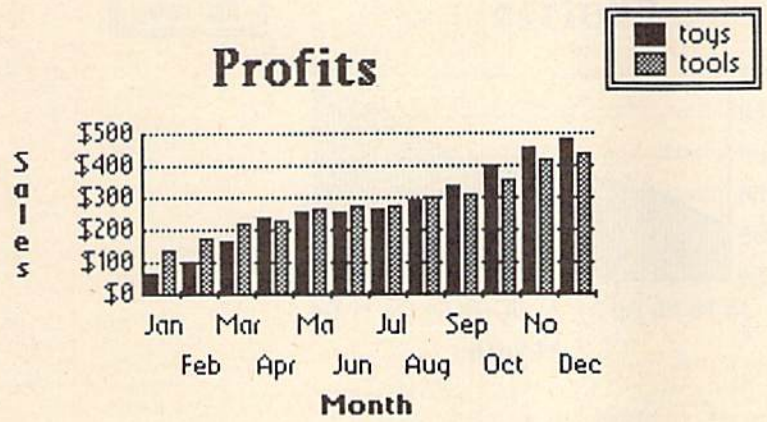
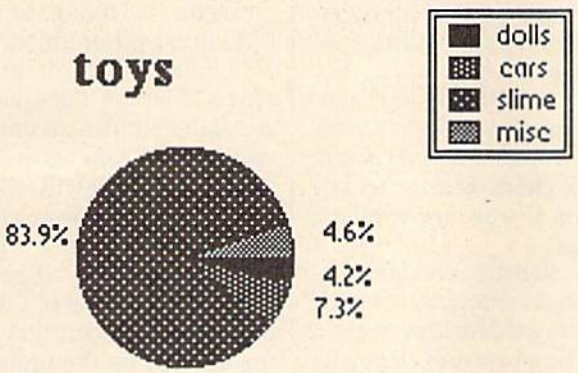


Figure 3. A pie chart can be developed for a single series of data.



gives an inflated impression of its abilities, however. You *can* create a line or column chart with 50 values, but only for four series. For other charts, this will simply be too many values to chart. The column chart, for instance, can accommodate more values than the bar chart simply because the column chart arranges the values horizontally, which offers more space than the bar chart's vertical arrangement.

Identify the first series by clicking on the first cell to be contained. Then, holding the mouse (or joystick) button down, pull the pointer through the series you want to chart (either horizontally or vertically). When you are finished, click on the row or column that contains the next series, and the cells which constitute that series will be marked for you. The four series you choose can be selected from any of the available categories, but they will always be the same series, and you can only select one series in a given row or column.

In other words, you could highlight the first and second quarters of industrial losses in the example above. Clicking anywhere in the industrials row, then, would have no further effect. Clicking in the utilities row would cause the first and second quarters to be highlighted.

If you make a mistake, you can clear the selection by clicking on a button marked Clear.

Chart Mode

When you have made the selection you want, click on the button marked Chart. You will instantly be taken to the chart-drawing area, and your figures will be entered into a column graph, commonly known as a *histogram*. This is the default, but you have eight other options. As it happens, the column graph is the most versatile option, but if, for instance, you are a psychologist comparing the results of various kinds of test scores, you might prefer to look at the scattergram to get a visual impression of the correlation of scores on two different tests.

If you have a very few series, or if you want only to chart the first 20 values in the first four columns, you can skip selecting the rows and columns to chart and simply click on the chart button.

Formatting Charts

Once your chart is created, you can use the Edit menu to access many different formatting options for your chart. First, you can copy and paste. Paste is the option used for importing data and Copy is used to export data.

Below these options in the Edit menu are selections for changing the range of the chart, the marker, the text, the grid, and the format.

Range. Often, if there is a minimum value in the chart, *geoChart* uses it as the baseline. That is, in a column chart with a minimum value of 3, the bottom line of the chart will be made equal to 3, and any value of 3 simply won't have a column. This might prove confusing to a reader, so you'll probably want to change the range to begin at 0 or 2 so that a column will ap-

pear. Also, in the example mentioned earlier, a set of scores on one kind of test, such as an IQ test, would probably have similar—but not identical—ranges. The maximum on one test might be 125, for instance, and the maximum on the other might be 130. Using the range option, you can adjust the scattergram so the ranges of scores on both axes are the same.

Marker. You can select the pattern used for the individual values used in the chart. You can, in fact, select any of the familiar 32 patterns available in *geoPaint*. In scattergrams and line graphs, you can select the symbol used to identify the points charted. You have the choice of a square, a filled square, a diamond, or a filled diamond.

Text. You can change the font used for virtually all the text on the chart with the exception of the values, which are always in the system font. You can also cast text in bold, italic, reverse, outline, or underline type styles. Further, you can select whether a specific text section is visible or not. Although you can use any point size available, text above a point size of about 12 will look out of proportion, and in some circumstances it will cause the text to run off the screen.

The text-formatting option also allows you to edit the text sections of the chart.

Grid. There are three options for the background grid: no grid, a set of solid lines, and a set of dotted lines.

Format. You have a complete selection of number formats available. Guessing that most charts will involve money, the designers of *geoChart* made the default format cast the range values in dollars, but there are 14 different formats in all—some involving dollars, percentages, and scientific notation.

When your chart is formatted to the nines, select Copy from the Edit menu and you will be given the option of saving the chart full-size as a photo scrap for *geoPublish*, or reduced-size for export to *geoPaint* or *geoWrite*. The full-size photo scrap is intended for use with *geoPublish*.

Almost There

geoChart is a quick, powerful utility, and it's flexible like other GEOS utilities. It can create attractive and interesting charts of various kinds, utilizing data entered with a variety of utilities. It is not perfect, however.

For instance, each time you make a change in formatting, the chart has to be completely redrawn. That occurs quickly, however, taking perhaps 10–15 seconds for a very complex chart. But it can become tedious if you are making many changes.

Another slightly tiresome aspect is the widget chart, drawn each time you open *geoChart* to create a new chart. The purpose is to make *geoChart* immediately appealing visually and to reassure a newcomer of the program's speed and friendliness. Once this point is made, however, it would be nice to be able to turn off this feature and start the program in Data mode.

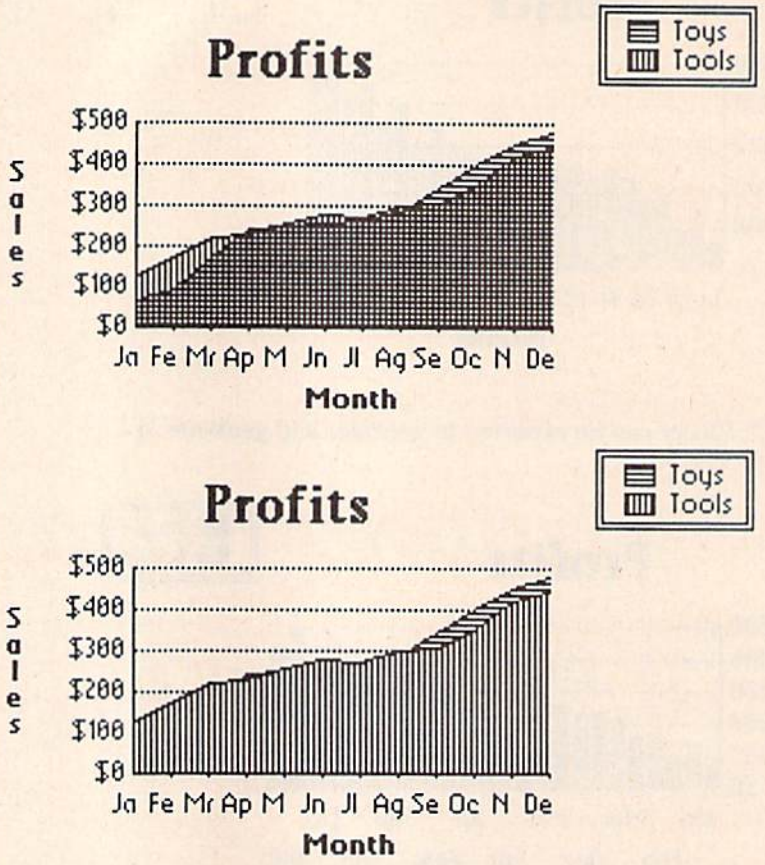
geoChart offers no option for entering missing values. You have to enter 0 as a placeholder in the event of missing data. Failure to enter 0 for a missing value will ruin the formatting of the rest of the series.

If you have many small values to chart, you will have formatting problems in trying to incorporate them into a pie or unibar chart. A pie with many values of, say, 1 or 2 percent will write values over each other. Under similar circumstances, the unibar chart won't write values over each other, but it will fail to write the values next to the appropriate sections of the bar, and it will write only 15 values vertically. If you have 16 or more values, some of them will simply be lost, though they will still be represented on the unibar.

As always, Berkeley's documentation (among the best in the industry) is complete and readable. The program comes on a single disk and must be installed (for copy protection); it includes the new version of the Note Pad, which doesn't have to be installed.

There is no quicker or easier way to present data than with a graph or chart, and *geoChart* is a simple and inexpensive way to produce good-looking graphs and charts.

Figure 4. Transparent (top) or opaque area charts can represent data more dramatically than line charts can.



Stacy J. Prowell

Adding sophisticated sound and music to your BASIC programs is quick and easy with this utility for the 64.

If you've ever added sound effects to a BASIC program, you know how difficult and time-consuming it can be to get just the right sound. With "Sound Wedge," you don't have to worry about arcane POKEs or intricate timing loops. Sound Wedge lets you add sound effects and music to your BASIC programs with a few simple PRINT commands.

The 64's SID chip can create some pretty incredible sound effects, but, unfortunately, BASIC doesn't include commands that allow you to program sound easily. Sound Wedge makes the job easier by adding new features to the familiar PRINT command. (If you've ever used the SOUND and PLAY commands from the 128's BASIC 7.0, then you have an idea of how to use Sound Wedge.)

Typing It In

Program 1, Sound Wedge, is written in machine language, so use "MLX," the machine language entry program found elsewhere in this issue, when entering it. When MLX prompts you, respond with the values given below.

Starting address: 0801
Ending address: 0D70

Be sure to save a copy of the program before leaving MLX.

Program 2, "Sound Wedge Demo," is an example of how to use Sound Wedge from a BASIC program. To prevent typing errors, use "The Automatic Proofreader," found elsewhere in this issue, when entering Program 2. Save a copy of the program to tape or disk when you've finished typing.

Getting Started

Install Sound Wedge by loading and running Program 1. Although it's written entirely in machine language, you can load and run it as if it were a BASIC program. Once Sound Wedge is installed, you can program the SID chip using the PRINT command.

Load and run Program 2, Sound Wedge Demo, to hear some of the sound capabilities of Sound Wedge. Be sure that Sound Wedge is installed before running the demo.

Sound Wedge creates 19 new commands, each introduced by BASIC's PRINT command. Many of these commands require numeric arguments, which are placed immediately following the command. Any characters located between a command and its argument are completely ignored by Sound Wedge. Also, because the 64 prints a space after a number, you must always place one character as a delimiter after a numeric argument. The delimiter will not be printed.

You can print numeric arguments in a number of different ways. For example,

```
PRINT "{V}15"
PRINT "{V}15 ";
PRINT "{V}"(3*2+9);
V=15: PRINT "{V}"V;
```

all set the volume to 15. Note that in the first example above, no semicolon is placed after the command. Without the semicolon, the PRINT command prints a carriage return after the string. The carriage return character is used by the wedge as the delimiter and is not printed. It may appear that no delimiter is printed after the last two examples, but because of the way the 64 formats numbers, PRINT sends an extra space after the number; this space is used as the delimiter.

Be careful when passing parameters to Sound Wedge. If a command doesn't require a numeric parameter, no delimiter is needed. If a numeric parameter is used, one character must be used as a delimiter between the parameter and the next command. Anything that isn't a command, an argument for a command, or a delimiter will be printed on the screen.

Sound Wedge doesn't print characters that it thinks are commands. This can lead to conflicts. For example, CTRL-2 (CHR$(5)) is normally used to change the character color to white. When Sound Wedge is installed, CTRL-E (also CHR$(5)) is used to erase the current voice's data. To get around this problem, you can disable Sound Wedge by printing CTRL-Z. CTRL-X reenables it. See Sound Wedge Demo for an example.

Sound Wedge Commands

Each Sound Wedge command with its description is listed below. The key sequence necessary to generate each command and any parameters needed by the command are listed on the left side of the column; the ASCII equivalent of each command is listed on the right.

The following commands affect either Sound Wedge itself or all three voices:

CTRL-Z **CHR$(26)**
Disable Sound Wedge. All characters except CTRL-X are passed on to the print routine without interpretation. CTRL-X is screened out so that Sound Wedge can be reenabled. See CTRL-X.

CTRL-X **CHR$(24)**
Enable Sound Wedge. CTRL-X causes Sound Wedge to intercept all characters and interpret those that it recognizes as commands. See CTRL-Z.

CTRL-C **CHR$(3)**
Clear all three voices and reset the SID chip.

CTRL-V *n* **CHR$(22)**
Set the volume to *n*, where *n* is a value between 0 and 15.

f1 **CHR$(133)**
Activate voice 1. Commands following this one operate on voice 1. For example, printing CHR$(133) followed by the attack command sets the attack for voice 1.

f3 **CHR$(134)**
Activate voice 2. See f1.

f5 **CHR$(135)**
Activate voice 3. See f1.

f7 **CHR$(136)**
Activate all voices. This is used to play all three voices together. When all three voices are selected, commands which change voice parameters do not work. See CTRL-P.

The following commands affect only the voice that is currently active:

CTRL-A *n* **CHR$(1)**
Set the current voice's attack value to *n*, where *n* is in the range 0–15.

CTRL-D *n* **CHR$(4)**
Set the current voice's decay value to *n*, where *n* is in the range 0–15.

CTRL-S *n* **CHR$(19)**
Set the current voice's sustain value to *n*, where *n* is in the range 0–15.

CTRL-R *n* **CHR$(18)**
Set the current voice's release value to *n*, where *n* is in the range 0–15.

CTRL-W *n* **CHR$(23)**
Select the waveform for the current voice; *n* must have one of the following values:

1 Triangle
2 Sawtooth
3 Pulse
4 Noise

CTRL-F *n* **CHR$(6)**
Set the frequency of the current voice to *n*; *n* must be in the range 0–65535.

CTRL-£ *n* **CHR$(28)**
Set the pulse rate to *n* for the current voice; *n* must be a value in the range 0–4095. This command is meaningful only if the pulse waveform has been selected. See CTRL-W.

CTRL-L *n* **CHR$(12)**
Set the length of the sound. The variable *n* is approximately the number of tenths of a second the sound is to play; *n* must be a value in the range 0–255. See CTRL-P.

CTRL-P **CHR$(16)**
Play the current sound. The play command plays the attack/decay cycle of the currently active voice or

Command	ASCII Value	Description
CTRL-Z	26	Disable Sound Wedge
CTRL-X	24	Enable Sound Wedge
CTRL-C	3	Clear all voices and reset SID chip
CTRL-V *n*	22	Set the volume level to *n*
f1	133	Select voice 1
f3	134	Select voice 2
f5	135	Select voice 3
f7	136	Select all three voices
CTRL-A *n*	1	Set attack
CTRL-D *n*	4	Set decay
CTRL-S *n*	19	Set sustain
CTRL-R *n*	18	Set release
CTRL-W *n*	22	Select waveform *n* = 1 triangle 2 sawtooth 3 pulse 4 noise
CTRL-F *n*	6	Set frequency
CTRL-£ *n*	28	Set pulse rate
CTRL-L *n*	12	Set sound to play *n*/10 seconds
CTRL-E	5	Clear (Erase) the current voice
CTRL-P	16	Play
CTRL-B *n*	2	Toggle the bits of the control register which are set in *n*

voices for the length of time defined with CTRL-L. When the sound stops playing, the release cycle begins. If all three voices are activated, CTRL-P plays the voices together.

CTRL-E **CHR$(5)**
Erase the current voice's sound registers. This command clears all the settings for the active voice. It is a good idea to begin defining a voice with this command.

CTRL-B *n* **CHR$(2)**
Set or clear bits in the current voice's control register. CTRL-B XORs (eXclusive ORs) the control register with *n*, effectively toggling the bits in the control register which correspond to the bits set in *n*. For example, to start the attack/decay sequence without using the play command, use a value of 1 for *n*. Other useful values of *n* include

8 Disable the current voice
4 Set ring modulation
2 Set synchronization

Helpful Hints

Sound Wedge commands may be printed directly in PRINT statements, but there's a better way. By defining string variables to contain the information to set up and play specific sounds, you can reuse sequences of commands without having to retype the strings. Each time you print the variable, Sound Wedge plays the sound. If you use the same sound frequently in your program, this technique can save quite a bit of memory.

If you use several similar sounds, don't include the play command (CTRL-P) in your definition. You can print the variable to set up the sound, print commands to change a few values, and then play the sound.

Customizing Sound Wedge

Sound Wedge itself occupies only about 1024 bytes of memory when it's running. To make Sound Wedge more flexible, a relocator is built into the program. The relocator adds approximately 500 more bytes to the program.

If you list Sound Wedge, you'll see one BASIC program line:

```
51200 SYS2061
```

The line number corresponds to the location where the relocator program installs Sound Wedge. Relocating Sound Wedge is simply a matter of changing the line number without disturbing the rest of the program. Follow these steps to relocate Sound Wedge:

- List Sound Wedge. You should see one BASIC program line.
- Type the old line number on a line by itself and press RETURN. (This erases the line from memory.)
- Cursor up to the old line and change the line number to the address where you want Sound Wedge to reside. Be sure to press RETURN after you've changed the line number.

It is important that you execute these steps in the correct order. If you try to change the line number before erasing the old line, the machine language will be corrupted.

Sound Wedge is disabled by RUN/STOP–RESTORE. To reenable it, type SYS *line number*, where *line number* is the BASIC line number you see when you list Sound Wedge.

See program listings on page 83.

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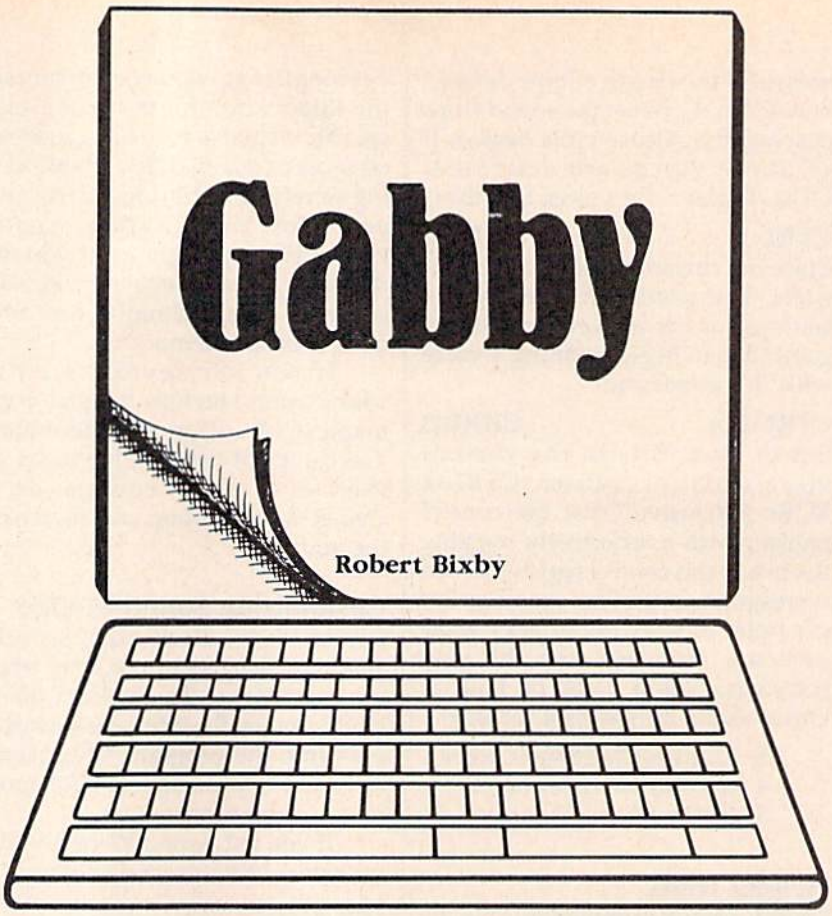


This powerful notepad is an ideal sidekick for the 64. "Gabby" is always ready for action, even while you're running another program.

Throw away the notepad you keep by your computer. "Gabby" is a *SpeedScript*-compatible mini-word processor that you can call up at any time. It also features a clock and a directory reader.

With Gabby, you can change gears from programming to writing with the touch of a key. Instead of loading *SpeedScript*, just press CTRL-RUN/STOP to activate the built-in word processor. After you've finished your note, return to your BASIC program without missing a beat. Gabby resides in hidden memory; it does not steal memory from BASIC.

Getting Started

Gabby is written entirely in machine language, so you'll need to use "MLX," the machine language entry program located elsewhere in this issue, when you enter the program. When prompted by MLX, respond with the values given below.

Starting address: 0801
Ending address: 1B78

Be sure to save a copy of the program when you've finished typing.

Load and run Gabby the way you would a BASIC program. The program will install itself at $C000 (49152). Now you can activate it by pressing CTRL-RUN/STOP or by typing SYS 49152. A gray screen with dark gray text appears. Simply begin typing.

A keypress brings you "Gabby," a mini-word processor that's always ready to go.

You can use the cursor keys to move through the text. Press HOME to go to the top left corner of the screen. A second HOME puts you at the start of the file. CLR (SHIFT-HOME) clears all text. CTRL-HOME moves you to the end of the file. Commodore-HOME takes you to the beginning. (The Commodore key is located below the RUN/STOP key at the lower left of the keyboard.)

Gabby toggles between insert and overwrite mode when you

press CTRL-I. This is indicated by the letter *I* or *O* in the lower right corner of the edit window. CTRL-Q exits the program and restores the screen. When you reenter the editor, the text from your previous session reappears.

To load a document, press f7. Save the document by pressing f8. For a disk directory, press CTRL-4. The screen clears and the directory is displayed. Press any key to pause the directory listing. After you've read the directory, press any key to return to Gabby.

To issue a disk command from within Gabby, press CTRL-↑ and enter the appropriate command. (The up-arrow key is located above the RETURN key.) For example, you scratch a file by pressing CTRL-↑ and then typing S0:*filename* at the disk-command prompt.

When you activate the program, the clock is set to 1:00:00 a.m. The timer will not start until you enter the correct time of day. Press CTRL-T and then type in the time. The cursor remains in the text window. The seconds value can be typed in, but it's ignored. Press RETURN when you have finished. This clock gives approximate time (disk access interrupts it), so don't trust it for important appointments.

Building Blocks

Gabby has powerful block commands for moving, copying, or deleting sections of text. To define a block of text, first move the cursor to the beginning of the block and press Commodore-←. (The back-arrow key is at the upper left corner of the keyboard.) Now the screen border turns yellow, awaiting the end-of-block definition. Move the cursor to the last character you want to include in the block and press Commodore-← again.

The green border gives the go-ahead for move, copy, or delete commands. Delete the block with Commodore-D. For the other commands, position the cursor to the new location and then press Commodore-M for *move* or Commodore-C for *copy*. Don't attempt any block commands when the screen border is yellow, because this causes the computer to lock up.

Gabby's documents have the same format as that of *SpeedScript* files, but you'll need *SpeedScript* for making printouts. Use either program for editing files and *SpeedScript* for making hardcopy.

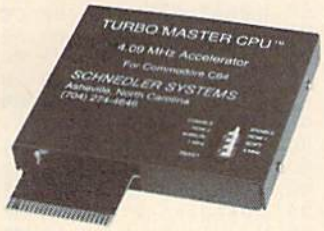
Memory Machinations

Gabby uses the memory hidden under Kernal ROM, BASIC ROM, and the 4K of free memory at 49152. File size is limited to 15K (approximately eight typewritten pages). Large files may cause block commands to fail. There are slide bars on the right and the bottom window borders. The bottom one indicates how much free memory is left. As it approaches the right edge, you should be aware that you're getting close to running out of memory. The bar on the right represents the current position in the file. When this reaches the bottom, you're at the end of the file.

If you press RUN/STOP–RESTORE, you'll disable the CTRL–RUN/STOP activation. In this case, use SYS 49152 to reactivate Gabby. This utility stores screen information when activated. The screen border, background, and text are restored when you exit by pressing CTRL-Q.

See program listing on page 84.

Introducing the World's Eighth Wonder.



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BEFORE TYPING . . .

Before typing in programs, please refer to "How to Type In COMPUTE!'s GAZETTE Programs," elsewhere in this issue.

Tank Ambush

See instructions in article on page 26 before typing in.

```
0801:0C 08 0A 00 9E 20 32 30 64
0809:36 32 00 00 00 A2 64 A9 BD
0811:00 9D 3C 03 CA 10 FA A9 76
0819:00 8D 15 D0 8D 1A D0 20 D2
0821:D8 08 AD 55 03 8D 56 03 A8
0829:A2 18 A9 00 9D 00 D4 CA 27
0831:D0 FA A9 1F 8D 18 D4 A9 AF
0839:14 8D 16 D4 A9 0A 8D 15 6C
0841:D4 A9 AA 8D 07 D4 A9 01 34
0849:8D 08 D4 A9 02 8D 09 D4 84
0851:8D 0A D4 A9 00 8D 0C D4 03
0859:A9 F0 8D 0D D4 A9 41 8D 5A
0861:0B D4 A9 F2 8D 17 D4 20 23
0869:B1 0F 20 BB 12 20 1F 12 37
0871:20 A2 14 A9 02 8D 3F 03 1F
0879:8D 3E 03 8D 45 03 8D 48 B2
0881:03 8D 52 03 20 90 0A 18 60
0889:A2 08 A0 0B 20 F0 FF A2 19
0891:00 BD C5 08 20 D2 FF E8 7F
0899:E0 13 D0 F5 A9 00 8D 18 D8
08A1:D4 A9 7C 8D 1B D0 A9 00 5E
08A9:48 A9 01 48 A0 00 A2 00 37
08B1:CA D0 FD 88 D0 F8 68 D0 AF
08B9:F5 20 A1 0F AD 42 03 D0 3F
08C1:F8 4C 0E 08 92 9C 47 20 59
08C9:41 20 4D 20 45 20 20 20 39
08D1:4F 20 56 20 45 20 52 A9 57
08D9:00 8D 21 D0 8D 20 D0 A9 B6
08E1:93 20 D2 FF 20 99 09 A2 3A
08E9:00 A9 0D 8D 3C 03 A9 0A 2A
08F1:8D 3D 03 A9 51 A0 5A 20 F4
08F9:66 09 A9 5A 8D D1 04 A9 BF
0901:0A 8D D1 D8 A9 51 8D E6 D7
0909:04 A9 0D 8D E6 D8 20 8E 6B
0911:09 A2 00 A9 0A 8D 3C 03 EC
0919:A9 0D 8D 3D 03 A9 5A A0 DC
0921:51 20 66 09 A9 0D 8D D1 AF
0929:D8 A9 51 8D D1 04 A9 5A 61
0931:8D E6 04 A9 0A 8D E6 D8 0C
0939:20 8E 09 20 AF 09 AD 00 1F
0941:DC 29 10 F0 03 4C E8 08 40
0949:AD 3C 07 C9 B1 D0 06 A9 45
0951:00 8D 55 03 60 C9 B2 D0 02
0959:06 A9 D7 8D 55 03 60 A9 CD
0961:B9 8D 55 03 60 9D A9 04 5F
0969:9D F9 04 48 AD 3C 03 9D CF
0971:A9 D8 9D F9 D8 98 E8 9D 7A
0979:A9 04 9D F9 04 AD 3D 03 09
0981:9D A9 D8 9D F9 D8 68 E8 AE
0989:E0 16 D0 D9 60 A2 96 A0 A4
0991:00 88 D0 FD CA D0 F8 60 AB
0999:18 A2 05 A0 0A 20 F0 FF BD
09A1:A2 00 BD D3 09 20 D2 FF 68
09A9:E8 E0 BD D0 F5 60 AD 00 B9
09B1:DC 29 0F C9 0E F0 05 C9 03
09B9:0D F0 0C 60 AD 3C 07 C9 4C
09C1:B3 F0 03 EE 3C 07 60 AD A5
09C9:3C 07 C9 B1 F0 03 CE 3C 7D
09D1:07 60 12 9A 54 20 41 20 31
09D9:4E 20 4B 20 20 41 20 4D 1A
09E1:20 42 20 55 20 53 20 48 C4
09E9:0D 0D 0D 20 20 20 20 20 4B
09F1:20 20 20 20 20 20 9B 20 FA
09F9:20 20 20 20 20 20 20 20 0C
0A01:20 20 20 20 20 20 20 20 15
0A09:20 0D 0D 0D 20 20 20 20 C4
0A11:20 20 20 20 20 20 20 20 25
0A19:20 43 4F 50 59 52 49 47 EA
0A21:48 54 20 31 39 38 39 0D AF
0A29:0D 20 20 20 20 20 20 20 B3
0A31:43 4F 4D 50 55 54 45 21 11
0A39:20 50 55 42 4C 49 43 41 8F
0A41:54 49 4F 4E 53 2C 20 49 75
0A49:4E 43 2E 0D 0D 20 20 20 35
0A51:20 20 20 20 20 20 20 41 86
0A59:4C 4C 20 52 49 47 48 54 1C
0A61:53 20 52 45 53 45 52 56 70
0A69:45 44 2E 0D 0D 0D 0D 0D 8B
0A71:20 20 20 20 20 20 20 20 85
0A79:20 20 9F 44 49 46 46 49 17
0A81:43 55 4C 54 59 20 4C 45 84
0A89:56 45 4C 20 20 12 31 AD FE
0A91:50 03 F0 0C 20 4C 0C AD 65
0A99:57 03 F0 01 60 4C B3 0A ED
0AA1:CE 51 03 D0 0D CE 52 03 2A
0AA9:D0 08 20 24 0C A9 04 8D 0B
0AB1:52 03 AD 46 03 F0 06 20 D1
0AB9:26 0E 4C 02 0B CE 47 03 33
0AC1:D0 14 CE 48 03 D0 0F A9 C4
0AC9:02 8D 48 03 AD 42 03 D0 C8
0AD1:05 A9 01 8D 46 03 20 A1 EB
0AD9:0F CE 40 03 D0 08 20 21 69
0AE1:0D A9 96 8D 40 03 CE 41 7F
0AE9:03 D0 08 20 52 0D A9 0A DA
0AF1:8D 41 03 AD 4C 03 F0 09 B1
0AF9:20 81 0B AD 1E D0 4C 3C C3
0B01:0B CE 44 03 D0 09 20 4B 3F
0B09:0B AD 55 03 8D 44 03 AD 1C
0B11:1E D0 8D 4B 03 A2 00 BD 31
0B19:21 0E 2D 4B 03 DD 21 0E 7D
0B21:F0 08 E8 E0 04 D0 F0 4C 6E
0B29:3C 0B AD 4B 03 29 04 C9 19
0B31:04 D0 08 8E 4D 03 A9 01 32
0B39:8D 4C 03 A2 64 CA D0 FD A1
0B41:AD 8D 02 C9 01 F0 F4 4C 70
0B49:90 0A A2 00 A0 00 B9 07 FD
0B51:D0 C9 9B B0 17 C9 5F D0 30
0B59:03 FE FB 07 C9 82 D0 03 9D
0B61:FE FB 07 18 B9 07 D0 69 4D
0B69:01 99 07 D0 E8 C8 C8 C0 11
0B71:08 D0 DB AD 50 03 C9 02 3A
0B79:F0 05 98 AA FE 07 D0 60 1D
0B81:AD 4F 03 D0 39 A9 FF 8D AD
0B89:4E 03 A9 02 8D 4F 03 AD 3A
0B91:4D 03 A8 18 6D 4D 03 AA F6
0B99:BD 07 D0 C9 5F B0 05 A9 78
0BA1:C7 4C B0 0B C9 73 B0 05 F7
0BA9:A9 C8 4C B0 0B A9 C9 99 87
0BB1:FB 07 CE 55 03 20 04 0C 63
0BB9:A0 19 20 84 0F 60 CE 4E 98
0BC1:03 D0 33 CE 4F 03 D0 2E 37
0BC9:A9 00 8D 4C 03 AD 4D 03 97
0BD1:A8 18 6D 4D 03 AA A9 4B 26
0BD9:9D 07 D0 B9 F8 0B 9D 06 6B
0BE1:D0 AD 10 D0 39 1C 0E 19 4A
0BE9:FC 0B 8D 10 D0 B9 00 0C 6D
0BF1:99 FB 07 20 1E 0C 60 18 B0
0BF9:7C E0 40 00 00 00 40 C1 D0
0C01:C4 C1 C4 A9 0F 8D 13 D4 C8
0C09:A9 4C 8D 14 D4 A9 64 8D 9F
0C11:0E D4 A9 04 8D 0F D4 A9 D6
0C19:81 8D 12 D4 60 A9 80 8D 1D
0C21:12 D4 60 A2 00 BD 07 D0 83
0C29:C9 96 B0 19 E8 E8 E0 08 28
0C31:D0 F3 A2 00 BD 07 D0 C9 78
0C39:78 B0 07 E8 E8 E0 08 D0 D4
0C41:F3 60 A9 01 2C A9 02 8D 4A
0C49:50 03 60 AD 54 03 D0 6C ED
0C51:A9 28 8D 53 03 A9 02 8D 7F
0C59:54 03 AD 50 03 C9 02 D0 2B
0C61:34 38 AD 56 03 ED 55 03 3A
0C69:4A 18 6D 55 03 8D 55 03 AB
0C71:A9 02 8D 20 D0 A9 80 8D 4E
0C79:1D D0 A5 A2 C9 7F 90 03 A3
0C81:A9 C3 2C A9 6E 8D 0E D0 16
0C89:A9 C8 8D 0F D0 A9 05 8D 10
0C91:54 03 4C A9 0C A9 A7 8D 9C
0C99:0F D0 A5 A2 C9 7F B0 03 FC
0CA1:A9 6E 2C A9 E6 8D 0E D0 A4
0CA9:AD 15 D0 09 80 8D 15 D0 BD
0CB1:AD 10 D0 29 7F 8D 10 D0 74
0CB9:20 04 0C 60 CE 53 03 D0 05
0CC1:25 CE 54 03 D0 20 AD 50 8D
0CC9:03 C9 02 D0 03 20 E8 0C 99
0CD1:AD 15 D0 29 7F 8D 15 D0 DF
0CD9:A9 00 8D 1D D0 8D 20 D0 18
0CE1:8D 50 03 20 1E 0C 60 CE E7
0CE9:C4 07 AD C4 07 C9 30 D0 B8
0CF1:06 A9 01 8D 57 03 60 A2 9A
0CF9:00 A0 00 B9 F8 0B 9D 06 0B
0D01:D0 AD 10 D0 39 1C 0E 19 6D
0D09:FC 0B 8D 10 D0 B9 00 0C 90
0D11:99 FB 07 A9 4B 9D 07 D0 22
0D19:C8 E8 E8 E0 08 D0 DC 60 9A
0D21:AD 43 03 C9 0E F0 08 C9 ED
0D29:0A F0 04 C9 06 D0 0B AD D8
0D31:03 D0 C9 B7 90 1A CE 03 43
0D39:D0 60 C9 0D F0 08 C9 09 22
0D41:F0 04 C9 05 D0 0A AD 03 6B
0D49:D0 C9 C8 B0 03 EE 03 D0 0D
0D51:60 AD 43 03 C9 0C B0 22 A1
0D59:C9 09 90 1E A9 02 8D 08 07
0D61:D4 20 A4 0D CE 3F 03 D0 9D
0D69:34 20 2D 0F A9 02 8D 3F EB
0D71:03 8D 3E 03 A9 01 8D 08 DC
0D79:D4 60 AD 43 03 C9 05 90 D9
0D81:1C C9 08 B0 18 A9 02 8D 21
0D89:08 D4 20 DC 0D CE 3E 03 D1
0D91:D0 0B 20 D4 0E A9 02 8D D0
0D99:3F 03 8D 3E 03 A9 01 8D F7
0DA1:08 D4 60 A2 00 A0 00 BD 6B
0DA9:07 D0 C9 81 B0 0A C9 5E 6C
0DB1:B0 03 20 CE 0D 20 CE 0D 69
0DB9:20 CE 0D C8 E8 E8 E0 08 7A
0DC1:D0 E5 AD 50 03 C9 02 F0 AC
0DC9:03 20 CE 0D 60 BD 06 D0 EE
0DD1:C9 FF D0 03 20 12 0E FE 7F
0DD9:06 D0 60 A2 00 A0 00 BD A1
0DE1:07 D0 C9 81 B0 0A C9 5E A4
0DE9:B0 03 20 06 0E 20 06 0E 8C
0DF1:20 06 0E C8 E8 E8 E0 08 A0
0DF9:D0 E5 AD 50 03 C9 02 F0 E4
0E01:03 20 06 0E 60 BD 06 D0 1F
0E09:D0 03 20 12 0E DE 06 D0 3C
0E11:60 B9 21 0E 4D 10 D0 8D AA
0E19:10 D0 60 F7 EF DF BF 7F FA
0E21:08 10 20 40 80 AD 49 03 9D
0E29:D0 33 20 B4 0E A2 00 EE B3
0E31:03 D0 E8 E0 03 D0 F8 A9 25
0E39:01 8D 49 03 A9 00 8D 4A 45
0E41:03 AD 03 D0 38 E9 0F 8D CC
0E49:05 D0 AD 15 D0 09 04 8D 63
0E51:15 D0 A9 CA 8D FA 07 A9 1E
0E59:02 8D 29 D0 60 CE 4A 03 E1
0E61:D0 1E A2 00 CE 03 D0 E8 CE
0E69:E0 03 D0 F8 A9 00 8D 49 12
0E71:03 8D 46 03 AD 15 D0 29 F7
0E79:FB 8D 15 D0 20 CE 0E 60 5F
0E81:AD 4A 03 C9 C8 D0 F8 AD 2D
0E89:03 D0 38 E9 B4 0A 0A 18 FA
0E91:69 4B AA E0 64 B0 05 A9 32
0E99:CB 4C A8 0E E0 7D B0 05 08
0EA1:A9 CC 4C A8 0E A9 CD 8D 1A
0EA9:FA 07 8E 05 D0 A9 0A 8D F5
0EB1:29 D0 60 A9 00 8D 00 D4 48
0EB9:A9 04 8D 01 D4 A9 29 8D 9A
0EC1:05 D4 A9 0B 8D 06 D4 A9 53
0EC9:81 8D 04 D4 60 A9 80 8D 10
0ED1:04 D4 60 A9 00 85 FB A9 83
0ED9:04 85 FC A9 00 85 FD A9 4F
0EE1:D8 85 FE A2 04 A0 00 B1 2A
0EE9:FB 8D 3C 03 B1 FD 8D 3D FC
0EF1:03 C8 B1 FB 88 91 FB C8 03
0EF9:B1 FD 88 91 FD C8 C8 C0 FD
0F01:28 D0 EF A0 27 AD 3C 03 DA
0F09:91 FB AD 3D 03 91 FD 18 EA
0F11:A5 FB 69 28 85 FB A5 FC 15
0F19:69 00 85 FC A5 FD 69 28 8C
0F21:85 FD A5 FE 69 00 85 FE 7B
0F29:CA 10 BA 60 A9 00 85 FB 62
0F31:A9 04 85 FC A9 00 85 FD FB
0F39:A9 D8 85 FE A2 04 A0 27 90
0F41:B1 FB 8D 3C 03 B1 FD 8D 15
0F49:3D 03 88 B1 FB C8 91 FB 15
0F51:88 B1 FD C8 91 FD 88 88 8A
0F59:10 F1 A0 00 AD 3C 03 91 06
0F61:FB AD 3D 03 91 FD 18 A5 1B
```

```
0F69:FB 69 28 85 FB A5 FC 69 17
0F71:00 85 FC A5 FD 69 28 85 56
0F79:FD A5 FE 69 00 85 FE CA 55
0F81:10 BC 60 20 8B 0F 88 D0 5F
0F89:FA 60 A2 05 FE E0 07 BD 29
0F91:E0 07 C9 3A D0 09 A9 30 EC
0F99:9D E0 07 CA 4C 8D 0F 60 63
0FA1:AD 00 DC A8 29 0F 8D 43 A0
0FA9:03 98 29 10 8D 42 03 60 71
0FB1:A9 0A 85 FB A9 10 85 FC 2D
0FB9:A9 00 85 FD A9 30 85 FE 55
0FC1:A0 00 20 F2 0F C9 63 F0 BA
0FC9:09 20 E9 0F 98 D0 18 4C 27
0FD1:C3 0F 20 F2 0F 48 20 F2 95
0FD9:0F AA 68 20 E9 0F CA D0 2B
0FE1:FA 98 D0 03 4C C3 0F 60 DD
0FE9:91 FD E6 FD D0 02 E6 FE 68
0FF1:60 B1 FB AA E6 FB D0 02 A1
0FF9:E6 FC A5 FB C9 1F 90 07 32
1001:A5 FC C9 12 90 01 C8 8A 32
1009:60 00 FA 00 03 FA C0 07 45
1011:FA D0 17 FA D4 17 FA D4 43
1019:17 FA D4 17 FA D4 17 FA E3
1021:D4 17 FA D4 17 FA D4 17 83
1029:FA D4 17 FA D4 17 FA D4 5C
1031:17 FA D4 17 FA D4 17 FA FB
1039:D4 17 FA D4 17 FA D4 17 9B
1041:FA D4 17 FA D4 17 FA D4 74
1049:05 63 00 1F 10 00 00 74 AB
1051:00 00 A8 00 00 44 63 00 5E
1059:33 10 00 00 50 00 01 D4 70
1061:00 02 A8 00 03 5C 00 02 A2
1069:A8 00 01 04 63 00 27 04 AB
1071:00 00 04 00 01 55 00 01 70
1079:F5 00 01 55 00 0A AA 80 08
1081:0B 57 80 0A AA 80 05 55 64
1089:40 05 01 40 05 01 40 63 3F
1091:00 26 04 00 00 19 00 00 20
1099:15 00 00 7F 40 00 55 40 29
10A1:00 51 40 63 00 2C 15 00 2F
10A9:00 6A 40 00 66 40 00 37 D7
10B1:00 01 77 50 01 FF D0 01 B0
10B9:55 50 01 51 50 63 00 20 FD
10C1:04 00 00 55 40 01 AA A0 35
10C9:06 AA A4 06 A6 A4 06 B7 18
10D1:A4 03 F7 F0 17 77 75 1F B3
10D9:FF FD 1F FF FD 15 55 55 A1
10E1:15 55 55 15 40 55 63 00 FB
10E9:17 20 10 02 02 00 00 28 F7
10F1:80 00 4A 00 02 AA 20 00 96
10F9:6E 80 00 29 00 00 AA 80 D9
1101:00 1A 00 00 29 00 00 11 04
1109:63 00 18 80 80 00 04 10 04
1111:08 90 88 00 0A 20 02 28 69
1119:08 08 BA 20 00 A9 00 01 42
1121:6A 10 02 AA 80 00 6E 80 C8
1129:02 E9 80 02 AA 00 02 9A EA
1131:80 00 69 00 00 51 63 00 CC
1139:15 10 00 00 8A 00 08 22 70
1141:00 12 22 08 08 2A E0 21 78
1149:28 90 00 AE 88 08 BA 60 C8
1151:02 A9 80 01 8A A2 23 AA CE
1159:80 0A 6E 80 0A E9 E8 02 DF
1161:AA A0 10 9A 88 0A A9 A0 0D
1169:02 91 40 63 00 14 08 00 8F
1171:00 28 00 00 28 00 00 AA 89
1179:00 00 AA 00 00 AA 00 02 9D
1181:AA 80 02 AA 80 02 AA A0 06
1189:0A AA A0 0A AA A0 0A AA A6
1191:A0 0A AA A0 0A AA A0 0A 2C
1199:AA A0 0A AA A0 0A AA A0 48
11A1:0A AA A0 63 00 20 20 00 7E
11A9:00 80 00 00 08 00 00 20 4C
11B1:00 00 10 63 00 30 20 00 0D
11B9:00 80 00 02 08 00 00 A0 FC
11C1:00 00 A0 00 00 50 63 00 FF
11C9:27 20 63 00 04 02 22 00 60
11D1:00 20 00 08 A8 80 02 AA 72
11D9:00 00 A8 00 00 64 00 00 A2
11E1:10 63 00 15 04 63 00 04 E7
11E9:10 00 00 00 20 80 00 82 99
11F1:04 08 28 00 02 22 00 00 B5
11F9:08 00 02 28 80 00 2A 00 3B
1201:08 AA 20 02 AA 80 00 A2 F1
1209:00 02 AA 80 02 8A 80 0A 50
1211:AB A0 0A AA A0 01 AA 40 BD
1219:00 55 63 00 07 00 A9 C0 4B
1221:8D F8 07 8D F9 07 A9 CA 0E
1229:8D FA 07 A9 FF 8D 1C D0 8D
1231:A9 01 8D 27 D0 8D 28 D0 6C
1239:A9 00 8D 25 D0 A9 0F 8D 0F
1241:26 D0 A9 83 8D 17 D0 A9 2E
1249:00 8D 1B D0 A9 02 8D 29 DA
1251:D0 8D 2A D0 8D 2B D0 8D DB
1259:2C D0 8D 2D D0 8D 2E D0 36
1261:A9 AC 8D 00 D0 8D 02 D0 C8
1269:8D 04 D0 A9 CD 8D 01 D0 81
1271:A9 BE 8D 03 D0 A9 C1 8D 3A
1279:FB 07 8D FD 07 A9 C4 8D E4
1281:FC 07 8D FE 07 A9 CE 8D 91
1289:FF 07 A9 4D 8D 07 D0 8D 31
1291:09 D0 8D 0B D0 8D 0D D0 78
1299:A9 18 8D 06 D0 A9 7C 8D 5E
12A1:08 D0 A9 E0 8D 0A D0 A9 21
12A9:40 8D 0C D0 A9 40 8D 10 59
12B1:D0 AD 15 D0 09 7B 8D 15 BF
12B9:D0 60 A9 E7 85 FB A9 12 93
12C1:85 FC A0 00 B1 FB 20 D2 8C
12C9:FF E6 FB D0 02 E6 FC A5 7F
12D1:FB C9 A2 D0 EF A5 FC C9 A1
12D9:14 D0 E9 A9 5F 8D E7 07 1C
12E1:A9 07 8D E7 DB 60 93 92 E6
12E9:05 20 20 20 20 20 A4 AF 19
12F1:B9 A2 B9 AF A4 0D 20 20 87
12F9:20 20 A3 B7 B8 B7 A3 20 32
1301:20 20 20 20 20 20 20 20 27
1309:20 20 20 20 A4 AF B9 A2 47
1311:B9 AF A4 20 20 20 0D 20 52
1319:20 20 20 20 20 20 20 20 3F
1321:20 20 20 20 20 20 20 20 47
1329:20 20 20 20 20 20 20 20 4F
1331:A3 B7 B8 B7 A3 0D 20 20 5B
1339:20 20 20 20 20 20 20 20 5F
1341:20 20 20 95 A4 AF B9 A2 D6
1349:12 B8 B7 A3 B7 B8 92 A2 40
1351:B9 AF A4 0D 12 B7 B8 92 19
1359:A2 B9 AF A4 AF B9 A2 12 3B
1361:B8 B7 A3 20 20 20 20 20 2A
1369:20 20 20 20 20 20 20 20 8F
1371:20 20 A3 B7 B8 92 A2 B9 AE
1379:AF A4 AF B9 A2 12 B8 B7 B8
1381:A3 92 0D 11 11 11 11 11 D0
1389:11 11 11 11 11 11 11 11 AF
1391:12 9E 20 20 20 20 20 20 50
1399:20 20 20 20 20 20 20 20 BF
13A1:20 20 20 20 20 20 20 20 C7
13A9:20 20 20 20 20 20 20 20 CF
13B1:20 20 20 20 20 20 20 20 D7
13B9:20 20 20 20 20 20 92 A9 4E
13C1:90 C6 C6 C6 C6 C6 C6 C6 CC
13C9:CE 9E DF 12 20 20 20 20 FD
13D1:20 20 20 20 20 20 20 20 F7
13D9:92 A9 90 CD C6 C6 C6 C6 48
13E1:C6 C6 C6 9E DF 12 20 20 87
13E9:20 20 20 20 20 92 A9 90 5D
13F1:C6 C6 C6 C6 C6 C6 C6 CE 20
13F9:20 CE 20 2E 20 2E 20 2E F2
1401:2E 20 2E 20 2E 20 CD 20 BD
1409:CD C6 C6 C6 C6 C6 C6 C6 B4
1411:9E DF 12 20 20 20 20 20 A6
1419:92 A9 90 C6 C6 C6 C6 C6 19
1421:C6 C6 CE 20 CE 2E 20 20 C9
1429:20 20 20 20 20 20 20 20 51
1431:20 20 2E CD 20 CD C6 C6 A0
1439:C6 C6 C6 C6 C6 9E DF 12 3E
1441:20 20 20 92 A9 90 C6 99 65
1449:54 41 4E 4B 53 90 C6 CE A3
1451:20 CE 2E 20 20 20 20 20 E6
1459:20 20 20 20 20 20 20 20 81
1461:20 2E CD 20 CD C6 99 53 F0
1469:43 4F 52 45 90 C6 9E DF 62
1471:12 20 92 A9 90 C6 C6 C6 8B
1479:99 33 90 C6 C6 C6 CE 20 C8
1481:CE 2E AF B9 A2 12 B8 B7 B4
1489:A3 20 20 20 20 A3 B7 B8 49
1491:92 A2 B9 AF 2E CD 20 CD 94
1499:C6 99 30 30 30 30 30 90 C7
14A1:C6 78 A9 C1 8D 14 03 A9 09
14A9:14 8D 15 03 A9 32 8D 12 55
14B1:D0 AD 11 D0 29 7F 8D 11 50
14B9:D0 A9 81 8D 1A D0 58 60 E2
14C1:AD 19 D0 8D 19 D0 30 07 6D
14C9:AD 0D DC 58 4C 31 EA AD D7
14D1:12 D0 C9 59 B0 0A A9 03 0A
14D9:8D 21 D0 A9 59 4C F6 14 C3
14E1:C9 D1 B0 0A A9 07 8D 21 BF
14E9:D0 A9 D1 4C F6 14 A9 0C 4B
14F1:8D 21 D0 A9 32 8D 12 D0 9A
14F9:4C BC FE 00 00 00 00 00 57
```

64 Runner

See instructions in article on page 61 before typing in.

```
1C01:3D 1C 64 00 99 22 93 4C 34
1C09:4F 41 44 20 41 20 46 49 24
1C11:4C 45 20 49 4E 20 31 32 E0
1C19:38 20 4D 4F 44 45 22 3A C9
1C21:99 22 41 4E 44 20 52 55 58
1C29:4E 20 49 54 20 49 4E 20 E1
1C31:36 34 20 4D 4F 44 45 2E AE
1C39:22 00 54 1C 6E 00 99 3A AF
1C41:85 22 46 49 4C 45 20 4E 28
1C49:41 4D 45 22 3B 4E 41 24 F9
1C51:00 71 1C 78 00 85 22 44 8F
1C59:45 56 49 43 45 20 4E 55 C3
1C61:4D 42 45 52 20 20 38 9D 2E
1C69:9D 9D 22 3B 44 45 00 8D 94
1C71:1C 82 00 85 22 44 52 49 C0
1C79:56 45 20 4E 55 4D 42 45 C0
1C81:52 20 20 30 9D 9D 9D 22 B2
1C89:3B 44 4E 00 AE 1C 8C 00 39
1C91:FE 11 28 4E 41 24 29 2C 90
1C99:42 31 2C 55 28 44 45 29 20
1CA1:2C 44 28 44 4E 29 2C 50 0A
1CA9:32 30 34 39 00 C0 1C 96 F2
1CB1:00 DE 9C 3A FE 02 31 35 70
1CB9:3A 9E 37 33 36 32 00 00 4B
1CC1:00 78 A9 07 8D 06 D5 A9 97
1CC9:7E 8D 00 FF A2 00 BD E2 18
1CD1:1C 9D 00 C0 E8 D0 F7 8E 94
1CD9:16 D0 A5 AE A4 AF 4C 00 6D
1CE1:C0 A2 E3 86 01 A2 2F 86 7F
1CE9:00 A2 00 8E 30 D0 A2 40 FD
1CF1:8E 06 D5 8D 60 C0 8C 61 07
1CF9:C0 A2 F7 8E 05 D5 A2 FF E7
1D01:9A D8 20 A3 FD 20 50 FD 0C
1D09:20 15 FD 20 5B FF 20 53 C8
1D11:E4 20 BF E3 20 22 E4 A2 F1
1D19:FB 9A 58 AD 60 C0 AC 61 9E
1D21:C0 85 AE 85 2D 84 AF 84 AA
1D29:2E A9 01 8D 02 08 20 33 81
1D31:A5 20 59 A6 A9 0D 20 D2 70
1D39:FF A9 00 20 90 FF 4C AE AB
1D41:A7 00 00 00 00 00 00 00 4F
```

Gridlock

Article on page 30.

```
MA 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATONS, INC. -
      {SPACE}ALL RIGHTS RESERV
      ED
RF 20 PRINTCHR$(27)"M{2 HOME}
      {CLR}":COLOR0,1:COLOR4,1
BX 30 DIMNM$(6),NP$(6),AP$(6),
      BL$(7),BP$(6,6),GP(6,6):
      DEFFNR(X)=INT(RND(1)*X)+
      1
HE 40 FORX=1TO7:PC$(X)=MID$("
      {RED}{$13}{YEL}{GRN}{BLU}
      {PUR}{CYN}",X,1):NEXT
AA 50 X=X+1:IFX>6THENX=1
SM 60 PRINTPC$(X):GL$="GRIDLOC
      "
RC 70 PRINT"{HOME}{3 DOWN}"TAB
      (8)"{RVS}£{21 SPACES}N"
```

```
      :PRINTTAB(8)"{RVS}
      {SPACE}{OFF}{WHT}U*I{A}*
      I{A}{R}{S}{A}*I{R}
      {2 SPACES}U*IU*I"PC$(X)"
      {RVS}{SPACE}":PRINTTAB(8
      )"{RVS}{SPACE}{OFF}{WHT}
      -{SPACE}{S}{Q}{R}K
      {SPACE}-{SPACE}-{SPACE}-
      -{2 SPACES}-{SPACE}--
      {2 SPACES}"PC$(X)"{RVS}
      {SPACE}"
SA 80 PRINTTAB(8)"{RVS}{SPACE}
      {OFF}{WHT}J*K{E}JK{Z}{E}
      {X}{Z}*K{Z}*{X}J*KJ*K"PC
      $(X)"{RVS}{SPACE}":PRINT
      TAB(8)"{RVS}N{21 SPACES}
      {OFF}£"
XK 90 PRINT"{DOWN}{12 RIGHT}CO
      PYRIGHT 1989":PRINT"
      {6 RIGHT}COMPUTE! PUBLIC
      ATIONS, INC."
AM 100 PRINT"{10 RIGHT}ALL RIG
      HTS RESERVED"
GK 110 PRINT"{5 DOWN}{8 RIGHT}
      {WHT}HOW MANY PLAYERS?
      {SPACE}(1-5)
EE 120 GETA$:IFA$=""THEN50
KM 130 IFA$<"1"ORA$>"5"THEN50:
      ELSEPL=VAL(A$)
QJ 140 FORX=1TOPL
HE 150 PRINTPC$(X)"{CLR}{DOWN}
      {RIGHT}WHAT IS PLAYER #
      "X"{LEFT}'S NAME";:INPU
      TNM$(X):IFNM$(X)=""THEN
      150
CG 160 NM$(X)=LEFT$(NM$(X),9):
      NEXT:PL=PL+1:NM$(PL)="C
      OMPUTER"
MF 170 FORX=1TO8:READBX$(X):NE
      XT:DATA"{3 @}","{3 P}",
      "{3 O}","{3 I}","{RVS}
      {3 U}","{RVS}{3 Y}","
      {RVS}{3 T}","{RVS}
      {3 SPACES}"
HP 180 OL$="O{Y}P{DOWN}
      {3 LEFT}{G}{SPACE}{M}
      {DOWN}{3 LEFT}L{P}@":FO
      RX=1TO6:READNP$(X),AP$(
      X):NEXT:FORX=1TO7:READB
      L$(X):NEXT
GB 190 BL$(PL)=BL$(7)
BR 200 A$="{HOME}{DOWN}{RIGHT}
      ":FORX=1TO6:B$=A$:FORY=
      1TO6:BP$(Y,X)=B$:B$=B$+
      "{4 RIGHT}":NEXT:A$=A$+
      "{4 DOWN}":NEXT
BK 210 PRINT"{CLR}":FORY=1TO6:
      FORX=1TO6:PRINTPC$(X)BP
      $(X,Y)OL$:NEXTX,Y
EC 220 PRINT"{HOME}{DOWN}"TAB(
      26)"{YEL}U**********I"
      :FORX=1TO3:PRINTTAB(26)
      "-"SPC(11)"-":NEXT:PRIN
      TTAB(26)"J*{WHT}COL
      {YEL}***{WHT}ROW{YEL}*K
      {2 DOWN}"
DS 230 FORX=1TO7:PRINTTAB(29)P
      C$(X)"{RVS}"LEFT$(GL$,X
      -1)"{WHT}{OFF}"MID$(GL$
      ,X,1)PC$(X)"{RVS}"MID$(
      GL$,X+1):NEXT
QF 240 PRINTTAB(26)"{DOWN}U***
      ********I":FORX=1TO6:PR
      INTTAB(26)"-"SPC(11)"-"
      :NEXT:PRINTTAB(26)"J***
      ********K{HOME}"
GC 250 REM ***** GAME LOOP ***
      **
GP 260 GW=0:FORP=1TOPL:WINDOW2
      7,17,37,22,1:PRINTPC$(P
      ):GOSUB450
JE 270 GOSUB380:PRINT"{WHT}":G
      OSUB700:IFNM$(P)="COMPU
      TER"THENGOSUB520:GOTO32
      0
GQ 280 WINDOW27,17,37,22,1:PRI
      NT"{HOME}"NM$(P):PRINT"
      ENTER{6 RIGHT}COL"C1"-"
      C2:PRINT"{DOWN}->";
AJ 290 GETKEYA$:A=VAL(A$):IFA<
      C1ORA>C2THEN290:ELSEPRI
      NTA",":CP=A
HK 300 PRINT"{HOME}{2 DOWN}ROW
      "CHR$(64+R1)" - "CHR$(
      64+R2):PRINT"{DOWN}
      {7 RIGHT}";
AG 310 GETKEYB$:IFB$<CHR$(64+R
      1)ORB$>CHR$(64+R2)THEN3
      10:ELSEPRINTB$:RP=ASC(B
      $)-64
AR 320 PRINT"{2 HOME}":F=8000:
      FORX=1TO8:F=F+200:PRINT
      BP$(CP,RP)"{3 SPACES}
      {DOWN}{3 LEFT}
      {3 SPACES}{DOWN}
      {3 LEFT}"BX$(X):SOUND1,
      F,1:NEXT
EX 330 FORX=1TO8:F=F+200:PRINT
      BP$(CP,RP)"{3 SPACES}
      {DOWN}{3 LEFT}"BX$(X)"
      {DOWN}{3 LEFT}{RVS}
      {3 SPACES}":SOUND1,F,1:
      NEXT
EQ 340 FORX=1TO8:F=F+200:PRINT
      BP$(CP,RP)BX$(X)"{DOWN}
      {3 LEFT}{RVS}{3 SPACES}
      {DOWN}{3 LEFT}
      {3 SPACES}":SOUND1,F,1:
      NEXT:PRINTBP$(CP,RP)"
      {RVS}"BL$(P):SOUND1,300
      0,10
CP 350 GP(CP,RP)=P:PRINT"{BLK}
      ":GOSUB700:GOSUB450:IFP
      C=126ANDPR=126THEN630
HM 360 NEXT:GOTO260
BD 370 REM ***** DICE ROLL ***
      **
FJ 380 WINDOW27,2,37,4,1:CL=P:
      FORX=1TO6:CL=CL+1:IFCL>
      6THENCL=1
PK 390 C1=FNR(6):C2=FNR(6):IFC
      1=C2THEN390
QQ 400 IFC1>C2THENQ=C2:C2=C1:C
      1=Q
BR 410 R1=FNR(6):R2=FNR(6):IFR
      1=R2THEN410
BR 420 IFR1>R2THENQ=R2:R2=R1:R
      1=Q
MA 430 PRINTPC$(CL)"{HOME}
      {RVS}{RIGHT}"NP$(C1)"
      {2 UP}"NP$(C2)"{2 UP}
      {RIGHT}"AP$(R1)"{2 UP}"
      AP$(R2):SOUND1,FNR(2000
      )+8000,5:NEXT:RETURN
HH 440 REM ***** CHECK FOR WIN
       *****
BM 450 PR=0:PC=0:FORX=1TO6:FOR
      Y=1TO6:IFGP(X,Y)=PTHENP
      C=PCOR(2↑X):PR=PROR(2↑Y
      )
PB 460 NEXTY,X:C=0:R=0:FORX=1T
      O6
AQ 470 IF(PCAND2↑X)<>0THENC=C+
      1
HK 480 IF(PRAND2↑X)<>0THENR=R+
      1
FM 490 IFC>4ANDR>4THENGW=GWOR2
      ↑PL
QF 500 RETURN
FC 510 REM ***** COMPUTER MOVE
       *****
QX 520 WINDOW27,17,37,22,1:PRI
      NT"{HOME}COMPUTER":PRIN
      T"MOVES:":PRINT"{DOWN}-
      >";:Q$="":QC=PC:QR=PR
GC 530 CM=0:FORX=C2TOC1STEP-1:
      FORY=R2TOR1STEP-1:MC=1
BJ 540 IFGP(X,Y)=PTHEN590
BE 550 IF(GWAND(2↑GP(X,Y)))<>0
      THENMC=MC+5
GP 560 IF(PCAND(2↑X))=0THENMC=
      MC+2
EC 570 IF(PRAND(2↑Y))=0THENMC=
      MC+2
DC 580 IFGP(X,Y)<>PANDGP(X,Y)<
      >0THENMC=MC+1
XP 590 Q$=Q$+STR$(MC):IFMC>CMT
      HENCM=MC:CP=X:RP=Y
MG 600 NEXTY,X:PRINTCP", "CHR$
      (64+RP):RETURN
MK 610 REM ***** GAME OVER ***
      **
JS 620 PRINT"{BLK}":FORC1=1TO3
      :R1=C1:C2=7-C1:R2=C2:GO
      SUB700:NEXT
CH 630 WINDOW27,17,37,22,1:PRI
      NT"{HOME}{YEL}GRIDLOC":
      PRINT"{2 SPACES}ACHIEVE
      D":PRINT"{4 SPACES}BY":
      PRINTNM$(P)
JS 640 FORX=1TO16:COLOR0,X:COL
      OR4,17-X:SOUND1,FNR(200
      0)+8000,5:NEXT:COLOR0,1
      :COLOR4,1
CF 650 PRINT"PLAY AGAIN?":PRIN
      T"{3 SPACES}(Y/N)"
XH 660 GETKEYA$:IFA$="Y"THENRU
      N
EB 670 IFA$<>"N"THEN660
KK 680 PRINTCHR$(27)"L{2 HOME}
      {CLR}":END
SR 690 REM ***** OUTLINE *****
AS 700 PRINT"{2 HOME}";:IFC1=1
      THEN720
BX 710 FORX=2TOC1:PRINT"
      {4 RIGHT}";:NEXT
FC 720 IFR1=1THEN740
MG 730 FORX=2TOR1:PRINT"
      {4 DOWN}";:NEXT
SB 740 PRINT" ";:FORX=C1TOC2:P
      RINT"*"CHR$(48+X)"**";:
      NEXT:PRINT"{LEFT}I";:FO
      RX=R1TOR2:PRINT"{DOWN}
      {LEFT}-{DOWN}{LEFT}"CHR
      $(64+X)"{DOWN}{LEFT}-
      {DOWN}{LEFT}-";:NEXT:PR
      INT"{LEFT}K";:FORX=C2TO
      C1STEP-1:PRINT"{2 LEFT}
      *{2 LEFT}"CHR$(48+X)"
      {2 LEFT}*{2 LEFT}*";:NE
      XT
DP 750 PRINT"{LEFT}J";:FORX=R2
      TOR1STEP-1:PRINT"{UP}
      {LEFT}-{UP}{LEFT}"CHR$(
      64+X)"{UP}{LEFT}-{UP}
      {LEFT}-";:NEXT:PRINT"
      {LEFT}U":PRINTPC$(P):RE
      TURN
MS 760 REM ***** DATA STMTS **
      ***
DD 770 DATA"{SPACE}{S}{DOWN}
      {2 LEFT}{SPACE}-{DOWN}
      {2 LEFT}{SPACE}{E}","UI
      {DOWN}{2 LEFT}{Q}{W}
      {DOWN}{2 LEFT}{2 E}","U
      I{DOWN}{2 LEFT}UK{DOWN}
      {2 LEFT}{Z}{X}","{R}I
      {DOWN}{2 LEFT}{Q}{W}
      {DOWN}{2 LEFT}{E}K","UI
      {DOWN}{2 LEFT}{SPACE}
      {W}{DOWN}{2 LEFT}JK","U
      I{DOWN}{2 LEFT}-{SPACE}
      {DOWN}{2 LEFT}JK","
      {2 R}{DOWN}{2 LEFT}{Z}
      {W}{DOWN}{2 LEFT}
      {SPACE}{E}","{R}I{DOWN}
```

```
        {2 LEFT}--{DOWN}
        {2 LEFT}{E}K"
QS 780  DATA"{A}{S}{DOWN}
        {2 LEFT}{Z}I{DOWN}
        {2 LEFT}JK","{A}{S}
        {DOWN}{2 LEFT}{Q}
        {SPACE}{DOWN}{2 LEFT}
        {Z}{X}","UI{DOWN}
        {2 LEFT}{Q}I{DOWN}
        {2 LEFT}JK","{A}{S}
        {DOWN}{2 LEFT}{Q}
        {SPACE}{DOWN}{2 LEFT}
        {E}{SPACE}"
SA 790  DATA"{SPACE}{S}{SPACE}
        {DOWN}{3 LEFT}{SPACE}-
        {SPACE}{DOWN}{3 LEFT}
        {SPACE}{E}{SPACE}","U*I
        {DOWN}{3 LEFT}U*K{DOWN}
        {3 LEFT}{Z}*{X}","U*I
        {DOWN}{3 LEFT}{SPACE}*
        {W}{DOWN}{3 LEFT}J*K"
GK 800  DATA"{R}{SPACE}{R}
        {DOWN}{3 LEFT}{Z}*{W}
        {DOWN}{3 LEFT}
        {2 SPACES}{E}","{A}*{S}
        {DOWN}{3 LEFT}{Z}*I
        {DOWN}{3 LEFT}J*K","U*I
        {DOWN}{3 LEFT}{Q}*I
        {DOWN}{3 LEFT}J*K","U*I
        {DOWN}{3 LEFT}-
        {2 SPACES}{DOWN}
        {3 LEFT}J*K"
```

Sound Wedge

See instructions in article on page 75 before typing in.

Program 1: Sound Wedge

```
0801:0B 08 00 C8 9E 32 30 36 79
0809:31 00 00 00 AD 03 08 85 C0
0811:FE 38 E9 7C 8D C3 08 AD EC
0819:04 08 85 FF E9 09 8D C4 31
0821:08 A9 B1 18 6D C3 08 8D 6F
0829:8A 09 8D 59 0A 8D 78 0A 89
0831:A9 09 6D C4 08 8D 8F 09 F0
0839:8D 5E 0A 8D 7D 0A A9 02 2B
0841:18 6D C3 08 8D 00 0A A9 DB
0849:0C 6D C4 08 8D 07 0A A9 1A
0851:46 18 6D C3 08 8D 1F 0A 33
0859:A9 0A 6D C4 08 8D 24 0A 83
0861:A9 1B 18 6D C3 08 8D BE FE
0869:0C A9 0D 6D C4 08 8D C3 87
0871:0C A9 7C 85 FC 8D BB 08 77
0879:A9 09 85 FD 8D BC 08 A9 4A
0881:64 8D BD 08 A9 0D 8D BE BA
0889:08 A9 F1 8D BF 08 A9 0B 9B
0891:8D C0 08 20 1F 09 A2 11 0F
0899:B1 FC 91 FE 20 64 0D CA 5B
08A1:D0 F6 A2 11 20 C7 08 CA 38
08A9:D0 FA A9 64 8D BF 08 A9 81
08B1:0D 8D C0 08 20 1F 09 6C 40
08B9:03 08 00 00 00 00 00 00 4D
08C1:00 00 00 00 00 00 B1 FC 32
08C9:8D C1 08 C8 B1 FC 8D C2 FD
08D1:08 88 38 AD C1 08 ED BB AF
08D9:08 8D C5 08 AD C2 08 ED 01
08E1:BC 08 0D C5 08 90 26 AD CC
08E9:C1 08 ED BD 08 8D C5 08 80
08F1:AD C2 08 ED BE 08 0D C5 5F
08F9:08 B0 12 AD C1 08 6D C3 24
0901:08 8D C1 08 AD C2 08 6D 29
0909:C4 08 8D C2 08 AD C1 08 DF
0911:91 FE 20 64 0D AD C2 08 A2
0919:91 FE 20 64 0D 60 A0 00 29
0921:B1 FC 8D C6 08 C9 20 F0 02
0929:34 29 1F C9 19 F0 2E 29 32
0931:0F C9 0B F0 28 29 0C C9 75
0939:0C F0 22 AD C6 08 29 9F F4
0941:F0 11 29 0F C9 08 F0 0B 81
0949:C9 0A F0 07 B1 FC 91 FE F4
0951:20 64 0D B1 FC 91 FE 20 95
0959:64 0D 4C 68 09 B1 FC 91 8B
0961:FE 20 64 0D 20 C7 08 38 C0
0969:A5 FC ED BF 08 8D C5 08 51
0971:A5 FD ED C0 08 0D C5 08 A7
0979:90 A4 60 78 AD 26 03 8D 2A
0981:A4 09 AD 27 03 8D A5 09 F2
0989:A9 B1 8D 26 03 A9 09 8D 4F
0991:27 03 58 60 AE A8 09 AC DF
0999:A9 09 AD A7 09 18 60 20 7C
09A1:95 09 4C B1 09 00 00 00 AD
09A9:00 00 00 00 00 00 00 00 BB
09B1:8D A7 09 8E A8 09 8C A9 AA
09B9:09 BA BD 05 01 C9 F5 D0 F2
09C1:0A BD 06 01 C9 A6 D0 03 A6
09C9:4C A0 09 AD A7 09 C9 18 33
09D1:D0 06 8D A6 09 4C 95 09 97
09D9:C9 1A D0 08 A9 00 8D A6 01
09E1:09 4C 95 09 AE A6 09 D0 C1
09E9:03 4C A0 09 A2 00 DD F1 F7
09F1:0B F0 08 E8 E0 11 D0 F6 39
09F9:4C A0 09 8A 0A 18 69 02 A9
0A01:8D 0C 0A A9 00 69 0C 8D 06
0A09:0D 0A 6C 02 0C 68 8D AF A0
0A11:09 68 8D B0 09 EE AF 09 EC
0A19:D0 03 EE B0 09 A9 46 8D 48
0A21:26 03 A9 0A 8D 27 03 A9 97
0A29:00 8D AE 09 8D AA 09 8D BD
0A31:AB 09 4C 95 09 29 F0 C9 D8
0A39:30 F0 02 38 60 AD A7 09 77
0A41:29 0F C9 0A 60 8D A7 09 19
0A49:8E A8 09 8C A9 09 C9 1A D7
0A51:D0 12 A9 00 8D A6 09 A9 4A
0A59:B1 8D 26 03 A9 09 8D 27 52
0A61:03 4C 95 09 20 36 0A 90 CB
0A69:1D AE AE 09 D0 03 4C 95 DE
0A71:09 A2 00 8E AE 09 A9 B1 3A
0A79:8D 26 03 A9 09 8D 27 03 A8
0A81:AD AA 09 6C AF 09 AE AE AC
0A89:09 D0 05 A9 22 8D AE 09 3F
0A91:0E AA 09 2E AB 09 AD AA E2
0A99:09 8D AC 09 AD AB 09 8D 77
0AA1:AD 09 0E AA 09 2E AB 09 9C
0AA9:0E AA 09 2E AB 09 18 AD D2
0AB1:AC 09 6D AA 09 8D AA 09 93
0AB9:AD AD 09 6D AB 09 8D AB 50
0AC1:09 AD A7 09 29 0F 18 6D 6E
0AC9:AA 09 8D AA 09 90 03 EE 51
0AD1:AB 09 4C 95 09 20 0E 0A CF
0AD9:0A 0A 0A 0A 8D AA 09 AD 2E
0AE1:A3 0B 29 0F 0D AA 09 8D 53
0AE9:A3 0B 4C 71 0C 20 0E 0A 3A
0AF1:AD A3 0B 29 F0 0D AA 09 D3
0AF9:8D A3 0B 4C 71 0C 20 0E ED
0B01:0A 0A 0A 0A 8D AA 09 65
0B09:AD A4 0B 29 0F 0D AA 09 1E
0B11:8D A4 0B 4C 71 0C 20 0E 47
0B19:0A AD A4 0B 29 F0 0D AA B6
0B21:09 8D A4 0B 4C 71 0C 20 C4
0B29:0E 0A 8D 18 D4 4C 95 09 08
0B31:20 0E 0A 8D 9E 0B AD AB 1D
0B39:09 8D 9F 0B 4C 71 0C 20 3C
0B41:0E 0A 8D A0 0B AD AB 09 0C
0B49:8D A1 0B 4C 71 0C 20 0E BE
0B51:0A 8D A5 0B 4C 95 09 A2 A2
0B59:00 8A 9D 9E 0B E8 E0 08 75
0B61:D0 F8 20 BF 0B 4C 95 09 DB
0B69:A2 00 8A 9D 9E 0B E8 E0 CF
0B71:20 D0 F8 A2 00 9D 00 D4 60
0B79:E8 E0 15 D0 F8 4C 95 09 19
0B81:20 0E 0A AA A9 08 0A CA 63
0B89:D0 FC AA AD A2 0B 29 0F 1A
0B91:8D A2 0B 8A 0D A2 0B 8D B7
0B99:A2 0B 4C 71 0C 00 00 00 C4
0BA1:00 00 00 00 00 00 00 00 B7
0BA9:00 00 00 00 00 00 00 00 BF
0BB1:00 00 00 00 00 00 00 00 C7
0BB9:00 00 00 00 00 00 AD BE E9
0BC1:0B 0A 0A 0A A0 00 AA D0 EC
0BC9:01 60 B9 9E 0B 9D 9E 0B B0
0BD1:E8 C8 C0 08 D0 F4 60 AD EF
0BD9:BE 0B 0A 0A 0A A0 00 AA 71
0BE1:D0 01 60 BD 9E 0B 99 9E 7B
0BE9:0B E8 C8 C0 08 D0 F4 60 B2
0BF1:85 86 87 88 01 04 13 12 36
0BF9:16 17 06 1C 0C 03 05 10 E9
0C01:02 30 0C 30 0C 30 0C 30 14
0C09:0C D6 0A EE 0A FF 0A 17 88
0C11:0B 28 0B 81 0B 31 0B 40 A5
0C19:0B 4F 0B 69 0B 58 0B AD FF
0C21:0C 24 0C 20 0E 0A 4D A2 A1
0C29:0B 8D A2 0B 4C 71 0C 20 8F
0C31:BF 0B AD A7 09 29 03 8D 9C
0C39:BE 0B 20 D8 0B 4C 95 09 C2
0C41:00 00 00 AD AA 0B 09 01 C8
0C49:8D 04 D4 AD AD 0B 8D 41 94
0C51:0C 60 AD B2 0B 09 01 8D 74
0C59:0B D4 AD B5 0B 8D 42 0C 5C
0C61:60 AD BA 0B 09 01 8D 12 96
0C69:D4 AD BD 0B 8D 43 0C 60 B1
0C71:A2 00 AD BE 0B D0 03 4C 6A
0C79:95 09 C9 01 D0 0E BD 9E C0
0C81:0B 9D 00 D4 E8 E0 07 D0 7D
0C89:F5 4C 95 09 C9 02 D0 0E F8
0C91:BD 9E 0B 9D 07 D4 E8 E0 A9
0C99:07 D0 F5 4C 95 09 BD 9E D7
0CA1:0B 9D 0E D4 E8 E0 07 D0 5F
0CA9:F5 4C 95 09 20 BF 0B 78 A1
0CB1:AD 14 03 8D AF 09 AD 15 F0
0CB9:03 8D B0 09 A9 1B 8D 14 46
0CC1:03 A9 0D 8D 15 03 A0 00 36
0CC9:8C 41 0C 8C 42 0C 8C 43 61
0CD1:0C AD BE 0B D0 0C 20 44 1F
0CD9:0C 20 53 0C 20 62 0C 4C 1A
0CE1:FA 0C C9 01 D0 06 20 44 E6
0CE9:0C 4C FA 0C C9 02 D0 06 39
0CF1:20 53 0C 4C FA 0C 20 62 DF
0CF9:0C A9 FF 8D AC 09 A9 06 3E
0D01:8D AD 09 58 AD AC 09 D0 F6
0D09:FB 78 AD AF 09 8D 14 03 99
0D11:AD B0 09 8D 15 03 58 4C D9
0D19:95 09 CE AD 09 D0 41 A9 AC
0D21:06 8D AD 09 AD 41 0C F0 63
0D29:0B CE 41 0C D0 06 AD AA 0A
0D31:0B 8D 04 D4 AD 42 0C F0 81
0D39:0B CE 42 0C D0 06 AD B2 42
0D41:0B 8D 0B D4 AD 43 0C F0 76
0D49:0B CE 43 0C D0 06 AD BA 7A
0D51:0B 8D 12 D4 AD 41 0C 0D 7B
0D59:42 0C 0D 43 0C 8D AC 09 66
0D61:6C AF 09 E6 FC D0 02 E6 43
0D69:FD E6 FE D0 02 E6 FF 60 35
```

Program 2: Sound Wedge Demo

```
FH 10  REM COPYRIGHT 1989 COMPU
       TE! PUBLICATIONS, INC. -
        ALL RIGHTS RESERVED
PJ 20  POKE53280,11:POKE53281,1
       1:PRINT"{CLR}{BLK}
       {3 SPACES}COPYRIGHT 1989
        COMPUTE! PUB., INC."
QJ 30  PRINTTAB(11)"ALL RIGHTS
       {SPACE}RESERVED":FORI=1T
       O1750:NEXTI
PP 40  PRINT"{Z}{WHT}{X}{CLR}
       {V}15"
EH 50  REM DEFINE BELL SOUND
RH 60  B$="{F1}{WHT}{W}2 {RED}2
       55 {F}10207 {A}0 {D}9
       {HOME}0 {RVS}0 {L}5 {P}"
HC 70  REM DEFINE GUNSHOT
PS 80  G$="{F3}{WHT}{W}4 {F}242
       78 {A}0 {D}0 {HOME}15
       {RVS}10 {L}1 {P}"
BX 90  REM DEFINE EXPLOSION
PF 100 E$="{F5}{WHT}{W}4 {F}53
       6 {A}1 {D}0 {HOME}15
       {RVS}12 {L}10 {P}"
JQ 110 REM DEFINE HARP
BG 120 H1$="{F1}{WHT}{W}2 {A}9
        {D}0 {HOME}15 {RVS}7 "
KQ 130 H2$="{F3}{WHT}{W}2 {A}9
        {D}7 {HOME}0 {RVS}0 "
HQ 140 REM NOTE THAT FREQUENCY
        ISN'T INCLUDED IN THE
       {SPACE}HARP
PX 150 REM DEFINITION. IT'S AD
       DED LATER, AND CHANGES
```

```
      {SPACE}ALONG WITH THE L
      ENGTH
PR 160 PRINT"PRINTING B$ RINGS
       A BELL...";B$
AJ 170 PRINT"G$ IS A GUNSHOT..
      .";G$
HK 180 FORI=1TO1000:NEXTI
GS 190 PRINT"E$ IS AN EXPLOSIO
      N!";E$
GJ 200 FORI=1TO2000:NEXTI
BX 210 RESTORE
QP 220 PRINT "{STOP}";H1$;"{L}
      Ø {B}1 ";H2$;:REM SET U
      P THE HARP
MQ 230 READA,B,L:IFA<ØTHEN260
BK 240 PRINT"{F1}{F}";A;"{F3}
      {F}";B;"{L}";L;"{F3}{P}
      ";:REM PLAY THE HARPS
HC 250 GOTO230
JS 260 PRINT"{F1}{B}1":FORI=1T
      O1000:NEXTI
PX 270 B$="{STOP}{V}15 ":REM C
      LEAR REGISTERS-VOLUME U
      P
PA 280 B$=B$+"{F1}{WHT}":REM S
      ELECT VOICE 1 AND CLEAR
       IT
SE 290 B$=B$+"{A}Ø {D}9 {HOME}
      Ø {RVS}Ø ":REM SET ENVE
      LOPE
RD 300 B$=B$+"{W}3 {RED}255 ":
      REM PULSE WAVEFORM-PULS
      E RATE 255
MJ 310 B$=B$+"{L}5 ":REM HALF-
      SECOND
QD 320 B$=B$+"{F}18188 ":REM C
      # IN FIFTH OCTAVE
KB 330 B$=B$+"{P}":REM PLAY TH
      E NOTE
FC 340 REM NOW PRINTING B$ PLA
      YS THE NOTE
RE 350 PRINT"{Z}{WHT}{X}";:REM
       MOMENTARILY DEACTIVATE
       THE WEDGE TO CHANGE CO
      LORS
JJ 360 PRINT"{CLR}{BLK}
      {2 DOWN}":GOSUB510
AB 370 PRINT"{CLR}{F3}{WHT}{W}
      2 {A}Ø {D}Ø {HOME}15
      {RVS}Ø {L}Ø {B}1":REM
      {2 SPACES}SET UP VOICE
      {SPACE}2 AND TURN IT ON
AE 380 FORB=ØTO2*↑STEP↑/100
GX 390 X=SIN(B)*8191+16384:REM
       GENERATE A SINE WAVE
ES 400 PRINT"{F}"INT(X);"*";:R
      EM CHANGE FREQUENCY AND
       PRINT AN ASTERISK
GP 410 NEXTB
BS 420 PRINT:PRINT"{B}1":REM T
      URN OFF VOICE 2
MP 430 GOSUB510
RF 440 C$="{F1}{WHT}{W}1 {A}3
      {SPACE}{D}Ø {HOME}15
      {RVS}15 {F}2145 {L}10 "
      :REM 3RD OCTAVE C
HM 450 E$="{F3}{WHT}{W}1 {A}3
      {SPACE}{D}Ø {HOME}15
      {RVS}15 {F}2703 {L}10 "
      :REM 3RD OCTAVE E
BD 460 G$="{F5}{WHT}{W}1 {A}3
      {SPACE}{D}Ø {HOME}15
      {RVS}15 {F}3215 {L}10 "
      :REM 3RD OCTAVE G
AD 470 PRINTC$"{P}"E$"{P}"G$"
      {P}";:REM PLAY EACH NOT
      E WITH A 1 SEC DELAY
BJ 480 PRINT"{F1}{F}4190 {F3}
      {F}5406 {F5}{F}6430"
HX 490 PRINTC$"{F7}{P}";:REM P
      LAY ALL THREE VOICES TO
      GETHER
SR 500 FORI=1TO5000:NEXTI:PRIN
      T"{Z}THAT'S IT!":END:RE
      M TURN OFF WEDGE
DS 510 PRINT"PRESS ANY KEY..."
      B$
SQ 520 GETA$:IFA$=""THEN520
JH 530 RETURN
DF 540 DATA 4050,4817,4
HM 550 DATA 4050,4817,4
PM 560 DATA 4050,4817,4
ES 570 DATA 3215,5407,8
AM 580 DATA 3215,5407,4
CA 590 DATA 3608,5728,4
AS 600 DATA 3608,5407,4
RC 610 DATA 3608,4817,4
XJ 620 DATA 2864,4241,4
PB 630 DATA 2864,4817,4
KC 640 DATA 2864,5407,4
CC 650 DATA -1,Ø,Ø
```

Gabby

See instructions in article on page 78 before typing in.

```
0801:0B 08 FF FF 9E 32 32 38 F2
0809:38 00 EE 08 FF FF 8F 22 D4
0811:0D 0D 0D 0D 0D 0D 0D 0D 21
0819:0D 0D 0D 0D 0D 0D 0D 0D 29
0821:0D 0D 0D 0D 0D 0D 0D 0D 31
0829:20 20 20 20 20 20 20 20 39
0831:20 20 20 20 B0 C0 C0 C0 2A
0839:C0 C0 C0 C0 C0 C0 C0 C0 49
0841:C0 C0 C0 AE 0D 20 20 20 2E
0849:20 20 20 20 20 B0 C0 C0 7D
0851:C0 BD 43 4F 50 59 52 49 64
0859:47 48 54 20 31 39 38 39 C3
0861:AD C0 C0 C0 AE 0D 20 20 A6
0869:20 20 20 20 20 20 DD 43 18
0871:4F 4D 50 55 54 45 21 20 F5
0879:20 50 55 42 4C 49 43 41 CB
0881:54 49 4F 4E 53 DD 0D 20 29
0889:20 20 20 20 20 20 20 AD 27
0891:C0 C0 AE 33 32 34 20 20 FD
0899:57 2E 20 57 45 4E 44 4F 95
08A1:56 45 52 B0 C0 C0 BD 0D 15
08A9:20 20 20 20 20 20 20 20 B9
08B1:20 20 20 AD AE 47 52 45 35
08B9:45 4E 53 42 4F 52 4F 2C 1D
08C1:20 4E 43 B0 BD 0D 20 20 6B
08C9:20 20 20 20 20 20 20 20 D9
08D1:20 20 AD C0 C0 C0 C0 C0 07
08D9:C0 C0 C0 C0 C0 C0 C0 C0 E9
08E1:C0 BD 0D 0D 0D 0D 0D 0D F7
08E9:0D 0D 0D 0D 00 00 00 78 AE
08F1:A9 63 8D 14 03 A9 C0 8D 70
08F9:15 03 A9 0A 85 FC A9 06 A4
0901:85 FB A9 AC 85 FE A9 00 50
0909:85 FD A9 00 A8 AA B1 FB E1
0911:91 FD E6 FD D0 02 E6 FE 83
0919:E6 FB D0 02 E6 FC A5 FD 4C
0921:C9 82 90 EA A5 FE C9 BC F2
0929:90 E4 A9 09 85 FC A9 5D 53
0931:85 FB A9 C0 85 FE A9 00 C1
0939:85 FD A9 00 A8 AA B1 FB 12
0941:91 FD E6 FD D0 02 E6 FE B3
0949:E6 FB D0 02 E6 FC A5 FD 7C
0951:C9 A8 90 EA A5 FE C9 C0 B0
0959:90 E4 58 60 78 A9 63 8D BC
0961:14 03 A9 C0 8D 15 03 A9 EF
0969:A2 8D 18 03 A9 C0 8D 19 E7
0971:03 A9 A4 8D 28 03 A9 C0 3E
0979:8D 29 03 58 A5 01 29 FE 05
0981:85 01 A9 0E 20 D2 FF A9 A2
0989:08 20 D2 FF 4C 82 AC 78 40
0991:A9 47 8D 18 03 A9 FE 8D C7
0999:19 03 A9 ED 8D 28 03 A9 C9
09A1:F6 8D 29 03 58 A5 01 09 4C
09A9:01 85 01 A9 09 20 D2 FF C6
09B1:AD FB B9 29 06 C9 04 F0 B3
09B9:05 A9 8E 20 D2 FF 60 8D 71
09C1:9F C0 8E A0 C0 AD A1 C0 70
09C9:D0 1E A5 C5 C9 3F D0 18 E1
09D1:AD 8D 02 C9 04 D0 11 A2 23
09D9:00 BD 95 C0 F0 07 9D 77 70
09E1:02 E8 4C 7D C0 E8 86 C6 0E
09E9:AD 9F C0 AE A0 C0 4C 31 8F
09F1:EA 53 59 53 34 39 31 35 CC
09F9:32 0D 00 00 00 00 78 40 99
0A01:A5 91 60 60 00 F0 F2 EF F7
0A09:E7 F2 E1 ED A0 E2 F9 F2 60
0A11:EF E2 E5 F2 F4 A0 E2 E9 9B
0A19:F8 E2 F9 B3 B0 B0 B6 A0 33
0A21:F3 F4 EF EE E5 E3 F5 F4 F8
0A29:F4 E5 F2 A0 F4 E5 F2 F2 B1
0A31:E1 E3 E5 E7 F2 E5 E5 EE 54
0A39:F3 E2 EF F2 EF AC A0 EE 8F
0A41:E3 A0 B2 B7 B4 B0 B5 A9 BE
0A49:0F 8D 20 D0 8D 21 D0 A9 95
0A51:D8 85 FC A9 A4 85 FE A9 50
0A59:00 85 FB 85 FD A8 AA B1 40
0A61:FB 91 FD A9 0B 91 FB C8 91
0A69:D0 F5 E6 FE E6 FC E8 E0 0E
0A71:04 90 EC 60 A9 A4 85 FC 37
0A79:A9 D8 85 FE A9 00 85 FB 8D
0A81:85 FD A8 AA 4C 5A AC A9 66
0A89:00 85 C6 A9 01 8D A1 C0 B4
0A91:AD 20 D0 8D FA B9 AD 21 B2
0A99:D0 8D F9 B9 AD 18 D0 8D 51
0AA1:FB B9 AD 86 02 8D 80 BC 44
0AA9:20 B2 B7 20 F9 AD 20 42 7C
0AB1:AC 4C 67 AD A9 04 85 FC 5C
0AB9:A9 A5 85 FB AD 9E B7 85 59
0AC1:FE AD 9F B7 85 FD 20 CF 64
0AC9:AC A5 FD 8D A3 B7 A5 FE 7C
0AD1:8D A4 B7 60 20 30 AF A0 94
0AD9:00 A6 FE EC A1 B7 90 1C 6F
0AE1:F0 02 B0 14 8C A2 B7 A5 4A
0AE9:FD 18 6D A2 B7 90 04 E8 CB
0AF1:4C D6 AC CD A0 B7 90 04 5D
0AF9:A9 20 D0 02 B1 FD 99 F4 D2
0B01:B4 C8 C9 1F F0 23 C9 9F 16
0B09:F0 1F CC 66 AD 90 CA 88 2D
0B11:B9 F3 B4 29 7F C9 20 F0 7E
0B19:10 C9 1F F0 0C 88 D0 F0 B1
0B21:AC 66 AD 8C 21 B5 4C 35 53
0B29:AD 8C 21 B5 C8 A9 20 99 7F
0B31:F3 B4 C8 CC 66 AD 90 F5 55
0B39:F0 F3 A0 00 B9 F4 B4 91 75
0B41:FB C8 CC 66 AD 90 F5 20 43
0B49:4C BB A5 FD 18 6D 21 B5 77
0B51:85 FD 90 02 E6 FE A5 FC 57
0B59:C9 07 B0 03 4C D2 AC A5 09
0B61:FB C9 43 B0 03 4C D2 AC F6
0B69:4C 42 AF 1E 20 23 AF 20 1B
0B71:0F B8 A4 C5 C0 3E D0 2D FB
0B79:AC 8D 02 C0 04 D0 26 20 65
0B81:D8 B7 AD FA B9 8D 20 D0 6C
0B89:AD F9 B9 8D 21 D0 AD FB A8
0B91:B9 8D 18 D0 AD 80 BC 8D 6E
0B99:86 02 A9 00 8D A1 C0 20 3D
0BA1:6F AC 4C 33 C0 E0 40 F0 52
0BA9:42 A0 00 8D A2 B7 20 30 46
0BB1:AF B1 FB 8D 24 B5 AD A2 5A
0BB9:B7 91 FB 20 42 AF EE A5 E5
0BC1:B7 D0 03 EE A6 B7 AD A6 4D
0BC9:B7 C9 FD 90 03 20 77 B6 35
0BD1:AD 25 B5 D0 07 AD 24 B5 B8
0BD9:C9 1F D0 03 20 E3 B1 20 FA
0BE1:15 AE 20 FD AF 20 77 B0 AF
0BE9:4C 67 AD 20 3E B8 20 D6 A3
0BF1:BA 20 42 AF A5 C5 C9 40 C8
0BF9:F0 EE 4C DA AD 00 AD F8 3D
0C01:AD C9 2F F0 08 20 0A B1 DD
0C09:A9 2F 8D F8 AD 20 E6 B7 76
0C11:A9 0F 8D 26 B5 A9 0E 4C 92
0C19:D2 FF A5 C5 D0 34 AD 8D EB
0C21:02 D0 0B A9 01 8D A2 B7 A5
0C29:20 44 B1 4C AF AC C9 01 22
0C31:D0 06 20 BC B1 4C AF AC CD
0C39:C9 04 D0 06 20 9C B1 4C D4
0C41:AF AC C9 02 D0 06 20 B4 49
0C49:B1 4C AF AC 20 CC B4 4C F7
0C51:AF AC C9 07 D0 1F AD 8D 02
0C59:02 D0 06 20 DD AF 4C AF 5F
0C61:AC C9 01 D0 06 20 E5 AF 9B
0C69:4C AF AC C9 02 D0 03 4C 6B
0C71:ED AF 4C F5 AF C9 02 D0 CE
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0C79:11 AD 8D 02 D0 06 20 54 8A
0C81:AF 4C AF AC 20 9B AF 4C 60
0C89:AF AC C9 21 D0 0F AD 8D 9B
0C91:02 C9 02 D0 01 60 C9 04 8B
0C99:D0 03 4C 35 B2 C9 14 D0 6D
0CA1:0A AD 8D 02 C9 02 90 03 76
0CA9:4C AB B6 C9 39 D0 0A AD 15
0CB1:8D 02 C9 02 90 03 4C C4 58
0CB9:B5 C9 24 D0 12 AD 8D 02 15
0CC1:C9 02 90 0B 20 AB B6 E0 FF
0CC9:00 F0 01 60 4C 36 B5 C9 B4
0CD1:03 D0 0B AD 8D 02 D0 03 F4
0CD9:4C 5D B2 4C 65 B2 C9 33 47
0CE1:D0 0D AD 8D 02 C9 01 F0 5E
0CE9:03 4C F3 B8 4C 0A B1 C9 58
0CF1:12 D0 0A AD 8D 02 C9 02 6D
0CF9:90 03 4C CC B8 C9 16 D0 5B
0D01:0A AD 8D 02 C9 04 D0 03 60
0D09:4C 10 BA C9 0B D0 0A AD 9E
0D11:8D 02 C9 04 D0 03 4C 90 A7
0D19:B3 C9 36 D0 0A AD 8D 02 77
0D21:C9 04 D0 03 4C 0C B4 60 C7
0D29:AD A6 B7 85 FC AD A5 B7 B4
0D31:85 FB A0 00 60 AD 22 B5 D4
0D39:F0 0C 78 A5 01 29 FC 85 64
0D41:01 A9 00 8D 22 B5 60 AD 75
0D49:22 B5 D0 0C A5 01 09 02 02
0D51:85 01 58 A9 01 8D 22 B5 4C
0D59:60 A9 01 8D A2 B7 20 30 6B
0D61:AF AD A5 B7 AC A6 B7 18 76
0D69:6D A2 B7 8D A2 B7 90 01 C8
0D71:C8 CC A1 B7 90 21 F0 02 BF
0D79:B0 08 AD A2 B7 CD A0 B7 BB
0D81:90 15 AE A0 B7 AC A1 B7 74
0D89:CA E0 FF D0 01 88 8C A6 38
0D91:B7 8E A5 B7 4C D5 AF 8D 02
0D99:A5 B7 8C A6 B7 4C D5 AF BA
0DA1:A9 01 8D A2 B7 20 30 AF FA
0DA9:AD A5 B7 AC A6 B7 38 ED 38
0DB1:A2 B7 B0 01 88 C0 C0 90 8A
0DB9:08 F0 02 B0 17 C9 A8 B0 41
0DC1:13 A9 A8 8D A5 B7 8D 9F 84
0DC9:B7 A9 C0 8D A6 B7 8D 9E E8
0DD1:B7 4C D5 AF 8D A5 B7 8C 8F
0DD9:A6 B7 20 77 B0 A0 0A 4C 19
0DE1:58 BB A9 0A 8D A2 B7 4C 9F
0DE9:59 AF A9 0A 8D A2 B7 4C 25
0DF1:A0 AF A9 64 8D A2 B7 4C 76
0DF9:59 AF A9 64 8D A2 B7 4C DA
0E01:A0 AF AD 9E B7 C9 C0 90 EF
0E09:0B F0 02 B0 11 AD 9F B7 68
0E11:C9 A8 B0 0A A9 C0 8D 9E FC
0E19:B7 A9 A8 8D 9F B7 AD 9E 3F
0E21:B7 CD A1 B7 90 1A AD 9F 24
0E29:B7 CD A0 B7 90 12 AE A1 EF
0E31:B7 AC A0 B7 88 8C 9F B7 51
0E39:C0 FF D0 01 CA 8E 9E B7 65
0E41:AD A6 B7 C9 C0 90 0B F0 C0
0E49:02 B0 11 AD A5 B7 C9 A8 D7
0E51:B0 0A A9 C0 8D A6 B7 A9 A9
0E59:A8 8D A5 B7 AD A6 B7 CD A2
0E61:A1 B7 90 17 F0 02 B0 08 B8
0E69:AD A5 B7 CD A0 B7 90 0B A9
0E71:A9 01 8D A2 B7 20 50 B3 11
0E79:4C 57 B0 60 AD 9E B7 CD D2
0E81:A6 B7 90 1B F0 02 B0 08 9B
0E89:AD 9F B7 CD A5 B7 90 0F 74
0E91:AD A5 B7 8D 9F B7 AD A6 9B
0E99:B7 8D 9E B7 20 AF AC 20 7D
0EA1:A0 B0 4C AF AC AD A6 B7 DF
0EA9:CD A4 B7 F0 05 B0 0B 4C 29
0EB1:E0 B0 AD A5 B7 CD A3 B7 6E
0EB9:90 2B AC A6 B7 AD A5 B7 60
0EC1:38 E9 2D B0 01 88 C0 C0 91
0EC9:90 0F F0 02 B0 04 C9 A8 02
0ED1:90 07 8C 9E B7 8D 9F B7 5E
0ED9:60 AD A5 B7 8D 9F B7 AD C9
0EE1:A6 B7 8D 9E B7 60 A9 04 71
0EE9:85 FC A9 D8 85 FE A9 00 46
0EF1:85 FB 85 FD AA A8 A9 20 CB
0EF9:91 FB A9 0B 91 FD C8 D0 AA
0F01:F5 E6 FC E6 FE E8 E0 04 43
0F09:90 EC A9 13 4C D2 FF A9 68
0F11:A8 8D A0 B7 8D A5 B7 A9 92
0F19:C0 8D A1 B7 8D A6 B7 EE 10
0F21:A0 B7 20 30 AF A9 C0 85 AF
0F29:FC A9 A8 85 FB A0 00 A9 A9
0F31:20 91 FB 20 28 B5 A5 FC A5
0F39:C9 FF 90 F3 A9 A2 8D FA 7B
0F41:FF A9 C0 8D FB FF 4C AF E2
0F49:AC AD A6 B7 C9 C0 D0 08 74
0F51:AD A5 B7 C9 A8 D0 01 60 2E
0F59:20 30 AF CE A5 B7 AD A5 83
0F61:B7 85 FB C9 FF D0 03 CE F0
0F69:A6 B7 AD A6 B7 85 FC AC 63
0F71:A2 B7 B1 FB A0 00 91 FB E8
0F79:AC A2 B7 20 28 B5 A5 FC EF
0F81:CD A1 B7 90 ED F0 02 B0 D6
0F89:09 A5 FB CD A0 B7 90 E2 D9
0F91:F0 E0 A9 20 91 FB 88 D0 F5
0F99:F9 20 70 B3 A0 64 4C 58 8D
0FA1:BB A9 C8 8D A2 B7 A9 20 61
0FA9:8D 23 B5 20 C6 B1 A9 20 80
0FB1:AC A2 B7 91 FB 88 D0 FB 7E
0FB9:60 A9 05 8D A2 B7 4C A1 1A
0FC1:B1 A9 20 8D 23 B5 A9 01 44
0FC9:8D A2 B7 20 30 AF 20 F4 C5
0FD1:B1 E0 00 F0 06 20 23 AF B6
0FD9:4C 77 B6 A0 01 20 30 AF 75
0FE1:AD 23 B5 91 FB 4C 42 AF B4
0FE9:AD 24 B5 8D 23 B5 A9 01 BB
0FF1:8D A2 B7 20 C6 B1 4C AF BD
0FF9:AC 20 30 AF AD A0 B7 85 5C
1001:FB AD A1 B7 C9 FD 90 03 A4
1009:A2 01 60 85 FC A0 00 B1 3B
1011:FB AC A2 B7 91 FB A0 00 E7
1019:20 A7 B7 A5 FC CD A6 B7 A8
1021:90 0B F0 02 B0 E9 A5 FB FE
1029:CD A5 B7 B0 E2 20 50 B3 87
1031:A0 0A 20 58 BB A2 00 4C 62
1039:42 AF AD 25 B5 D0 07 A9 17
1041:09 A2 01 4C 45 B2 A9 0F CA
1049:A2 00 8D 26 B5 8D 6B 07 90
1051:8E 25 B5 A5 C5 C9 40 D0 B9
1059:FA 60 97 4E 41 4D 45 3A EA
1061:20 00 A9 00 8D 27 B5 4C 87
1069:6A B2 A9 01 8D 27 B5 A9 CE
1071:00 85 C6 20 42 AF 20 E1 C0
1079:B0 20 7C B8 A2 16 A0 05 C8
1081:18 20 F0 FF 20 EC B9 A9 A5
1089:00 AA A8 BD 55 B2 F0 09 A5
1091:20 D2 FF E8 4C 86 B2 A0 87
1099:00 20 CF FF 99 FC B9 C8 B8
10A1:C9 0D D0 F5 C0 02 B0 03 D5
10A9:4C B9 B4 A9 14 20 D2 FF 56
10B1:88 98 A2 FC A0 B9 20 BD 4A
10B9:FF A9 08 A2 08 AC 27 B5 66
10C1:20 BA FF 20 C0 FF AD 27 2B
10C9:B5 F0 07 A2 C0 A0 A8 4C 32
10D1:D3 B2 AE A6 B7 AC A5 B7 3C
10D9:86 FC 84 FB A2 08 AD 27 84
10E1:B5 D0 0C 20 C6 FF 20 CF DA
10E9:FF 20 CF FF 4C 16 B3 20 4E
10F1:C9 FF 20 D2 FF 20 D2 FF 4E
10F9:20 30 AF A0 00 B1 FB A8 9D
1101:20 42 AF 98 20 D2 FF 20 AF
1109:28 B5 A5 FC CD A1 B7 90 26
1111:E7 A5 FB CD A0 B7 90 E0 D2
1119:4C 3F B3 20 B7 FF 29 40 F9
1121:D0 18 20 CF FF A8 20 30 C5
1129:AF 98 A0 00 91 FB 20 42 5C
1131:AF 20 28 B5 A5 FC C9 FD 46
1139:90 E1 A5 FB 8D A0 B7 A5 94
1141:FC 8D A1 B7 A9 08 20 C3 66
1149:FF 20 CC FF 20 E1 B0 20 17
1151:7C B8 4C B9 B4 AC A1 B7 58
1159:AD A0 B7 18 6D A2 B7 90 E8
1161:01 C8 C0 FD 90 08 C9 00 66
1169:D0 04 A0 FD A9 00 8D A0 F1
1171:B7 8C A1 B7 60 AC A1 B7 F2
1179:AD A0 B7 38 ED A2 B7 B0 2F
1181:01 88 CC A6 B7 90 0D F0 55
1189:02 B0 E3 CD A5 B7 90 04 63
1191:F0 02 B0 DA 60 20 42 AF 28
1199:20 E1 B0 20 B7 B3 A9 08 44
11A1:20 C3 FF 20 CC FF A5 C5 3E
11A9:C9 40 F0 FA 20 E1 B0 A9 22
11B1:00 85 C6 20 D8 B7 20 E6 DC
11B9:B7 4C AF AC A9 97 20 D2 4A
11C1:FF 20 CC FF A9 08 A2 08 40
11C9:A0 00 20 BA FF A2 0B A0 2D
11D1:B4 A9 01 20 BD FF 20 C0 C9
11D9:FF A2 08 20 C6 FF 20 B7 D5
11E1:FF 29 40 F0 01 60 20 CF FE
11E9:FF C9 22 D0 F1 20 CF FF 7F
11F1:C9 22 D0 08 A9 0D 20 D2 B0
11F9:FF 4C E1 B3 20 D2 FF 20 13
1201:B7 FF 29 40 F0 01 60 A5 1C
1209:C5 C9 40 F0 E0 4C 02 B4 8A
1211:24 20 42 AF 20 79 B4 A9 8C
1219:97 20 D2 FF 20 CC FF A9 49
1221:0F A2 08 A0 0F 20 BA FF EE
1229:A2 7E A0 07 AD B8 B4 20 9C
1231:BD FF 20 C0 FF A2 16 A0 9B
1239:05 18 20 F0 FF 20 7C B8 2B
1241:A2 0F 20 C6 FF 20 E4 FF 35
1249:C9 0D F0 06 20 D2 FF 4C AC
1251:40 B4 A9 0F 20 C3 FF 20 19
1259:CC FF 20 AF AC A5 C5 C9 34
1261:40 F0 FA A5 C5 C9 40 D0 42
1269:FA 20 E1 B0 A9 00 85 C6 79
1271:4C 7C B8 97 43 4F 4D 4D AA
1279:41 4E 44 3A 20 00 A9 00 52
1281:85 C6 20 42 AF 20 7C B8 F1
1289:20 EC B9 A2 16 A0 05 18 AF
1291:20 F0 FF A9 00 AA A8 BD 56
1299:6E B4 F0 07 20 D2 FF E8 E5
12A1:4C 92 B4 20 CF FF 99 7E 59
12A9:07 C8 C9 0D D0 F5 C0 02 6F
12B1:D0 01 60 A9 14 20 D2 FF EB
12B9:88 8C B8 B4 60 00 20 42 2D
12C1:AF A9 0F A2 08 A0 0F 20 35
12C9:BA FF A9 00 A8 AA 4C 2A 33
12D1:B4 20 54 AF A0 00 20 23 46
12D9:AF 20 30 AF B1 FB C9 20 10
12E1:D0 10 C8 C0 FE 90 F2 A9 61
12E9:FD 8D A2 B7 20 44 B1 4C 02
12F1:CC B4 8C A2 B7 4C 44 B1 8E
12F9:00 00 00 00 00 00 00 00 1E
1301:00 00 00 00 00 00 00 00 27
1309:00 00 00 00 00 00 00 00 2F
1311:00 00 00 00 00 00 00 00 37
1319:00 00 00 00 00 00 00 00 3F
1321:00 00 00 00 00 00 00 01 48
1329:00 00 00 0F 00 E6 FB D0 A4
1331:02 E6 FC 60 E6 FD D0 02 8A
1339:E6 FE 60 20 30 AF AD A0 DC
1341:B6 85 FB AD A6 B6 85 FC 96
1349:A0 00 AD A1 B6 85 FD AD 05
1351:A7 B6 85 FE 20 2F B5 B1 74
1359:FD 91 FB 20 2F B5 20 28 1D
1361:B5 A5 FC CD AA B6 90 EF 89
1369:F0 02 B0 07 A5 FB CD A4 6C
1371:B6 90 E4 A9 00 8D A5 B6 86
1379:20 77 B5 60 AD A1 B7 AA 58
1381:AD A0 B7 38 ED A2 B6 8D 16
1389:A0 B7 B0 01 CA 8A 38 ED F2
1391:A8 B6 8D A1 B7 60 AD A0 C0
1399:B6 18 6D A2 B6 8D A0 B6 DC
13A1:90 03 EE A6 B6 AD A6 B6 89
13A9:18 6D A8 B6 8D A6 B6 AD D9
13B1:A1 B6 18 6D A2 B6 8D A1 DC
13B9:B6 90 03 EE A7 B6 AD A7 C9
13C1:B6 18 6D A8 B6 8D A7 B6 73
13C9:60 AD C0 07 8D 95 B7 8D D3
13D1:A5 B6 AD 9F B6 D0 17 AD FC
13D9:A5 B7 8D A0 B6 AD A6 B7 ED
13E1:8D A6 B6 EE 9F B6 A9 07 70
13E9:8D 20 D0 4C 97 B7 AD A5 5A
13F1:B7 8D A1 B6 AD A6 B7 8D FB
13F9:A7 B6 CD A6 B6 90 56 F0 5B
1401:4C A9 05 8D 20 D0 AD A7 7A
1409:B6 8D A8 B6 AD A1 B6 38 0A
1411:ED A0 B6 8D A2 B6 B0 03 5C
1419:CE A8 B6 AD A8 B6 38 ED 03
1421:A6 B6 8D A8 B6 A9 00 8D 70
1429:9F B6 AD A1 B7 8D AA B6 9E
1431:AD A0 B7 8D A4 B6 AD C0 44
1439:07 8D A5 B6 AD A2 B6 18 E5
1441:69 01 8D A2 B6 90 03 EE 27
1449:A8 B6 4C 97 B7 AD A0 B6 E2
1451:CD A1 B6 90 AC AD A0 B6 BC
1459:8D A2 B7 AD A1 B6 8D A0 66
1461:B6 AD A2 B7 8D A1 B6 AD 2E
1469:A6 B6 8D A2 B7 AD A7 B6 E8
```

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1471:8D A6 B6 AD A2 B7 8D A7 72
1479:B6 4C FC B5 20 42 AF A0 15
1481:00 B9 99 B6 F0 07 99 74 02
1489:07 C8 4C 7C B6 A4 C5 C0 4D
1491:40 F0 FA A2 01 A5 C5 C9 93
1499:40 D0 FA 4C 7C B8 05 12 1D
14A1:12 0F 12 00 00 00 00 00 D8
14A9:00 00 00 00 00 00 00 00 D1
14B1:AD A5 B6 D0 03 4C 77 B6 EC
14B9:A9 0F 8D 20 D0 AD A2 B6 67
14C1:18 6D A0 B7 90 04 A9 01 C9
14C9:D0 02 A9 00 18 6D A1 B7 81
14D1:18 6D A8 B6 90 03 4C 77 82
14D9:B6 20 30 AF AD A1 B7 8D 57
14E1:A9 B6 AD A0 B7 8D A8 B6 3E
14E9:18 6D A2 B6 8D A0 B7 90 28
14F1:03 EE A1 B7 AD A1 B7 18 82
14F9:6D A8 B6 8D A1 B7 C9 FD 30
1501:90 0F AD A9 B6 8D A1 B7 6E
1509:AD A3 B6 8D A0 B7 4C 77 96
1511:B6 AD A9 B6 85 FE AD A3 C9
1519:B6 85 FD AD A0 B7 85 FB 85
1521:AD A1 B7 85 FC A0 00 B1 F5
1529:FD 91 FB 20 A7 B7 C6 FD DF
1531:A5 FD C9 FF D0 02 C6 FE 02
1539:A5 FE CD A6 B7 90 0B F0 21
1541:02 B0 E4 A5 FD CD A5 B7 B9
1549:B0 DD AD A6 B7 CD A6 B6 5C
1551:90 10 F0 03 4C 5D B7 AD 0B
1559:A5 B7 CD A0 B6 B0 03 20 A6
1561:91 B5 AD A0 B6 85 FB AD F2
1569:A6 B6 85 FC A0 00 AD A5 1B
1571:B7 85 FD AD A6 B7 85 FE 91
1579:B1 FB 91 FD 20 28 B5 20 BA
1581:2F B5 A5 FC CD A7 B6 90 40
1589:EF A5 FB CD A1 B6 90 E8 63
1591:F0 E6 A0 80 20 58 BB A2 86
1599:00 60 00 00 A5 C5 C9 40 F3
15A1:D0 FA 60 E0 00 00 00 00 0D
15A9:00 00 00 00 C6 FB A5 FB 41
15B1:C9 FF D0 02 C6 FC 60 20 06
15B9:30 AF A9 04 85 FE A9 A0 79
15C1:85 FC A9 00 85 FB 85 FD 48
15C9:A8 AA B1 FD 91 FB C8 D0 E7
15D1:F9 E6 FC E6 FE E8 E0 04 22
15D9:90 F0 4C 42 AF 20 30 AF 44
15E1:A9 A0 85 FE A9 04 85 FC 0F
15E9:4C BD B7 A9 04 85 FC A9 15
15F1:D1 85 FB A8 A9 20 91 FB 5D
15F9:C8 C0 15 90 F7 A0 00 20 C6
1601:4C BB A5 FC C9 06 90 EC 3B
1609:A5 FB C9 B1 90 E6 20 86 42
1611:B8 4C 6F B8 20 E4 FF C9 84
1619:0D F0 25 C9 20 B0 03 4C 5F
1621:38 B8 C9 40 90 12 C9 5E 93
1629:90 0B C9 C0 B0 03 4C 38 08
1631:B8 C9 DE 90 04 38 E9 40 26
1639:60 38 E9 80 60 A2 40 60 57
1641:A9 1F 60 20 A7 B7 20 23 97
1649:AF A0 00 20 30 AF B1 FB 17
1651:8D 85 B8 49 80 91 FB 20 B3
1659:AF AC 20 61 BB A0 05 20 2D
1661:30 AF 20 23 AF AD 85 B8 BF
1669:91 FB 20 28 B5 20 23 AF 08
1671:20 42 AF 60 A0 00 A9 40 D2
1679:99 4D 07 C8 C0 1E 90 F6 C9
1681:60 20 D8 B7 20 E6 B7 4C D4
1689:AF AC 00 A9 40 A0 00 99 71
1691:7D 04 C8 C0 1E 90 F8 A9 71
1699:A4 85 FB A9 04 85 FC A0 64
16A1:00 A9 5D 91 FB C8 C0 20 A1
16A9:90 F7 A0 00 20 4C BB A5 7F
16B1:FC C9 07 90 EC A5 FB C9 78
16B9:43 90 E6 A9 70 8D 7C 04 D9
16C1:A9 6E 8D 9B 04 A9 6D 8D F8
16C9:4C 07 AD 26 B5 8D 6B 07 B7
16D1:60 AD A5 B6 D0 03 4C 77 5C
16D9:B6 20 36 B5 20 42 AF A9 9E
16E1:0F 8D 20 D0 AD A0 B6 8D F4
16E9:A5 B7 AD A6 B6 8D A6 B7 E7
16F1:A0 FF 20 58 BB 4C 7C B8 B8
16F9:AD 8D 02 C9 04 F0 2C AD 27
1701:A6 B7 CD 9E B7 D0 08 AD D2
1709:A5 B7 CD 9F B7 F0 0F AD F8
1711:9E B7 8D A6 B7 AD 9F B7 04
1719:8D A5 B7 4C 23 AF A9 A8 07
1721:8D A5 B7 A9 C0 8D A6 B7 52
1729:4C 23 AF AC A1 B7 AD A0 EE
1731:B7 38 E9 02 8D A5 B7 B0 C9
1739:01 88 8C A6 B7 4C 23 AF EA
1741:00 00 00 A0 00 8C CA B9 FA
1749:20 E4 FF F0 FB C9 0D F0 E1
1751:70 AC CA B9 C0 08 D0 0E AD
1759:C9 41 F0 04 C9 50 D0 E8 35
1761:38 E9 40 4C AE B9 C9 30 13
1769:90 DE C9 3A B0 DA C0 00 E6
1771:D0 07 C9 32 90 28 4C 43 27
1779:B9 C0 01 D0 0B AE 16 BA DB
1781:E0 30 F0 04 C9 33 B0 C0 C7
1789:C0 03 D0 07 C9 36 90 0E B9
1791:4C 43 B9 C0 05 D0 07 C9 3D
1799:36 90 03 4C 43 B9 C0 02 B0
17A1:D0 04 C8 4C AE B9 C0 05 F9
17A9:D0 04 C8 4C AE B9 C0 09 06
17B1:D0 01 88 99 16 BA 99 82 84
17B9:04 C8 8C CA B9 C0 0A D0 10
17C1:87 A0 00 B9 82 04 99 16 E4
17C9:BA C8 C0 0A 90 F5 60 00 5D
17D1:A9 70 8D 59 04 A9 6E 8D 69
17D9:64 04 A9 7D 8D 81 04 A9 6C
17E1:6D 8D 8C 04 A0 00 A9 40 94
17E9:99 5A 04 C8 C0 0A 90 F8 D0
17F1:60 A9 20 A0 00 99 74 07 1F
17F9:C8 C0 24 90 F8 60 00 00 93
1801:00 00 00 00 00 00 00 00 31
1809:00 00 00 00 00 00 00 00 39
1811:00 00 00 00 00 20 3E B9 F7
1819:4C 6E BA 00 00 3A 00 00 4B
1821:3A 00 00 10 0D 00 00 00 D7
1829:00 00 00 00 00 00 00 00 59
1831:00 00 00 00 00 00 00 00 61
1839:00 00 00 00 00 00 00 00 69
1841:00 00 00 00 00 00 00 00 71
1849:00 00 00 00 00 00 00 00 79
1851:00 00 00 00 00 00 00 00 81
1859:00 00 00 00 00 00 00 00 89
1861:00 00 00 00 00 00 00 00 91
1869:00 00 00 00 00 00 00 00 99
1871:00 00 00 AD 1E BA C9 10 FB
1879:D0 08 A9 80 8D 3B B9 4C 6A
1881:82 BA A9 00 8D 3B B9 AD 51
1889:1A BA 38 E9 30 8D 3C B9 05
1891:AD 19 BA 38 E9 30 0A 0A E7
1899:0A 0A 0D 3C B9 8D 0A DC AB
18A1:AD 1D BA 38 E9 30 8D 3D 33
18A9:B9 AD 1C BA 38 E9 30 0A 25
18B1:0A 0A 0A 0D 3D B9 8D 09 70
18B9:DC AD 17 BA 38 E9 30 18 34
18C1:0D 3B B9 8D 3B B9 AD 16 89
18C9:BA 38 E9 30 0A 0A 0A 0A 3C
18D1:0D 3B B9 8D 0B DC A9 00 86
18D9:8D 08 DC 20 CB B9 AD 0B 1C
18E1:DC 29 80 F0 08 A9 10 8D 7E
18E9:1E BA 4C ED BA A9 01 8D 4C
18F1:1E BA AD 0B DC 29 10 4A 3C
18F9:4A 4A 4A 18 69 30 8D 16 E9
1901:BA AD 0B DC 29 0F 18 69 4A
1909:30 8D 17 BA AD 0A DC 29 BD
1911:F0 4A 4A 4A 4A 18 69 30 F1
1919:8D 19 BA AD 0A DC 29 0F AF
1921:18 69 30 8D 1A BA AD 09 B8
1929:DC 29 F0 4A 4A 4A 4A 18 FE
1931:69 30 8D 1C BA AD 09 DC 13
1939:29 0F 18 69 30 8D 1D BA 0A
1941:AD 08 DC A0 00 B9 16 BA BF
1949:99 82 04 C8 C0 0A 90 F5 3B
1951:60 A5 FB 18 69 28 85 FB 11
1959:90 02 E6 FC 60 A2 00 CA 59
1961:D0 FD 88 D0 FA 60 AE A1 F1
1969:B7 AD A0 B7 38 E9 A8 8D BA
1971:F6 BB 8D 82 BC B0 01 CA 5D
1979:8A 38 E9 C0 8D F5 BB 8D 91
1981:81 BC AE A6 B7 AD A5 B7 5B
1989:38 E9 A8 8D F8 BB B0 01 59
1991:CA 8A 38 E9 C0 8D F7 BB 59
1999:4E F5 BB 6E F6 BB 4E F5 08
19A1:BB 6E F6 BB 4E F5 BB 6E 18
19A9:F6 BB 4E F5 BB 6E F6 BB B0
19B1:AD F5 BB 8D F9 BB AD F6 99
19B9:BB 8D FA BB AD F5 BB D0 D5
19C1:11 AD F6 BB C9 0B B0 0A 68
19C9:A2 10 20 FC BB A2 00 4C D9
19D1:5C BC 20 28 BC 20 FC BB 04
19D9:AD 81 BC 8D F7 BB AD 82 40
19E1:BC 8D F8 BB A9 02 8D F5 17
19E9:BB 8D F9 BB A9 22 8D F6 40
19F1:BB 8D FA BB 20 28 BC 4C E7
19F9:5C BC 00 00 00 00 00 00 89
1A01:00 A9 04 85 FC A9 EB 85 64
1A09:FB A0 00 A9 10 8D FB BB 68
1A11:E0 10 90 02 A2 0F E0 00 FE
1A19:D0 05 A9 F5 4C 1C BC A9 81
1A21:6B 91 FB 20 4C BB CA CE A6
1A29:FB BB D0 EA 60 A2 00 AD 4E
1A31:F7 BB CD F9 BB 90 29 F0 0D
1A39:02 B0 08 AD F8 BB CD FA C3
1A41:BB 90 1D AD FA BB 18 6D 5A
1A49:F6 BB 8D FA BB 90 03 EE 5E
1A51:F9 BB AD F9 BB 18 6D F5 D5
1A59:BB 8D F9 BB E8 4C 2A BC 53
1A61:60 A9 07 85 FC A9 4D 85 18
1A69:FB A0 00 E0 1E 90 02 A2 AB
1A71:1D E0 00 D0 05 A9 F8 4C 86
1A79:77 BC A9 72 91 FB CA C8 CF
1A81:C0 1E 90 ED 60 00 00 00 91
1A89:0B 08 FF FF 9E 32 32 38 9F
1A91:38 00 F8 08 FF FF 8F 22 C2
1A99:0D 0D 0D 0D 0D 0D 0D 0D CD
1AA1:0D 0D 0D 0D 0D 0D 0D 0D D5
1AA9:0D 0D 0D 0D 0D 0D 0D 0D DD
1AB1:20 20 20 20 20 20 20 20 E5
1AB9:20 20 20 20 B0 C0 C0 C0 D6
1AC1:C0 C0 C0 C0 C0 C0 C0 C0 F5
1AC9:C0 C0 C0 AE 0D 20 20 20 DA
1AD1:20 20 20 20 20 B0 C0 C0 2A
1AD9:C0 BD 43 4F 50 59 52 49 11
1AE1:47 48 54 20 31 39 38 38 6F
1AE9:AD C0 C0 C0 AE 0D 20 20 53
1AF1:20 20 20 20 20 20 DD 43 C4
1AF9:4F 4D 50 55 54 45 21 20 A2
1B01:20 50 55 42 4C 49 43 41 79
1B09:54 49 4F 4E 53 DD 0D 20 D6
1B11:20 20 20 20 20 20 20 AD D4
1B19:C0 C0 AE 33 32 34 20 20 AB
1B21:57 2E 20 57 45 4E 44 4F 43
1B29:56 45 52 B0 C0 C0 BD 0D C2
1B31:20 20 20 20 20 20 20 20 67
1B39:20 20 20 AD AE 47 52 45 E2
1B41:45 4E 53 42 4F 52 4F 2C CA
1B49:20 4E 43 B0 BD 0D 20 20 19
1B51:20 20 20 20 20 20 20 20 87
1B59:20 20 AD C0 C0 C0 C0 C0 B4
1B61:C0 C0 C0 C0 C0 C0 C0 C0 97
1B69:C0 BD 0D 0D 0D 0D 0D 0D A5
1B71:0D 0D 0D 0D 00 00 00 00 E3
```

1581 Alphabetizer

Article on page 62.

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
SX 20 O$="":POKE53280,0:POKE53
      281,0:PRINT"{GRN}";:FORA
      =1TO30:O$=O$+CHR$(0):NEX
      T
BX 30 PRINT"{N}";:DIMZ$(296):V
      =0:B=1
JX 40 PRINT"{CLR}{12 DOWN}"TAB
      (12)"{YEL}DRIVE NUMBER
      {2 SPACES}8{3 LEFT}";
SX 50 INPUTDV$:DV=VAL(DV$):IF
      {SPACE}DV<8OR DV>30THEN4
      0
AM 60 OPEN15,DV,15,"UI":INPUT#
      15,A$,B$,C$,D$:CLOSE 15:
      IFRIGHT$(B$,2)="81"THEN1
      10
PE 70 PRINTTAB(9)"{DOWN}DEVICE
      "DV"ISN'T A 1581"
RC 80 PRINTTAB(7)"{DOWN}{YEL}P
```

```
      RESS ANY KEY TO TRY AGAI
      N"
PM 90 GETA$:IFA$=""THEN90
GK 100 GOTO40
FC 110 PRINT"{CLR}{YEL}
      {4 DOWN}"TAB(18)"1581"
AX 120 PRINTTAB(10)"{3
      {2 SPACES}{D}{RVS}
      {OFF}{F}
GR 130 PRINTTAB(10)"{2 SPACES}
      {RVS}{J}{U}{L}{OFF}"
HX 140 PRINTTAB(10)"{2 SPACES}
      {RVS} {RIGHT} {OFF} LPH
      ABETIZER
RQ 150 PRINT"{7}{4 DOWN}":A$="
      COPYRIGHT{2 SPACES}1989
      ":PRINTTAB(20-LEN(A$)/2
      )A$
PX 160 A$="COMPUTE! PUBLICATIO
      NS, INC.":PRINTTAB(20-L
      EN(A$)/2)A$
GR 170 A$="ALL RIGHTS RESERVED
      ":PRINTTAB(20-LEN(A$)/2
      )A$"{2 DOWN}{YEL}"
GB 180 A$="PRESS A KEY TO CONT
      INUE":PRINTTAB(20-LEN(A
      $)/2)A$
FR 190 GETA$:IFA$=""THEN190
RH 200 PRINT"{CLR}{18 DOWN}SCA
      NNING";
KB 210 OPEN15,DV,15,"I0":OPEN5
      ,DV,5,"#":S=3
SE 220 PRINT#15,"U1:";5;0;40;S
CE 230 PRINT#15,"U1:";5;0;40;S
SK 240 GET#5,T$,S$:S=ASC(S$)
PC 250 A$="":L=2:FORE=0TO29:GE
      T#5,B$:A$=A$+CHR$(ASC(B
      $+CHR$(0))):NEXT:GOSUB1
      050
QF 260 GET#5,B$,B$
MR 270 FORRAY=1TO6:A$=""
CD 280 FORE=0TO29:GET#5,B$:A$=
      A$+CHR$(ASC(B$+CHR$(0))
      ):NEXTE:GOSUB1050
PF 290 GET#5,B$,B$:NEXT RAY
PJ 300 A$="":FORE=0TO29:GET#5,
      B$:A$=A$+CHR$(ASC(B$+CH
      R$(0))):NEXT
FF 310 GOSUB1050:IFASC(T$+CHR$
      (0))=40THEN220
CP 320 PRINT
QE 330 PRINT#15,"U1:";5;0;40;0
      :GET#5,A$,A$,A$,A$:H$="
      ":FORZ=1TO16:GET#5,A$
GQ 340 H$=H$+A$:NEXT:CLOSE 5:C
      LOSE 15
HP 350 PRINT"{CLR}{YEL}ALPHABE
      TIZED DIR OF {RVS}"H$"
      {DOWN}"
XR 360 FOR T=1TO V
RF 370 IFLEN(Z$(T))=0THENVP=1:
      FORU=TTOV-1:Z$(U)=Z$(U+
      1):NEXTU:V=V-1:Z$(V+1)=
      ""
HS 380 IF VP=1 THEN T=T-1:VP=0
      :GOTO360
EE 390 NEXTT
GD 400 FORC=1TOV:PRINTRIGHT$("
      000"+RIGHT$(STR$(C),LEN
      (STR$(C))-1),3)+"
      {5 SPACES}";
SJ 410 PRINTCHR$(34)+MID$(Z$(C
      ),4,16)+CHR$(34),
QM 420 PRINTMID$("DELSEQPRGUSR
      RELCBM",ABS(ASC(LEFT$(Z
      $(C),1))AND15)*3+1,3);
PP 430 PRINTASC(MID$(Z$(C),29,
      1))+ASC(MID$(Z$(C),30,1
      ))*256
JC 440 NEXT:GOSUB720
GK 450 PRINT:PRINT"{CLR}{YEL}S
      AVE THIS NEW DIRECTORY?
      {RVS} {OFF}{LEFT}";
QR 460 GETA$:IFA$=""THEN460
JM 470 PRINTA$:IFA$<>"Y"THEN A
      $="N":GOTO680
RJ 480 CLOSE 15:OPEN15,DV,15,"
      I0":OPEN5,DV,5,"#":S=3
AQ 490 IF 8*(V/8)>INT(V/8)*8TH
      ENV=INT((V/8)+1)*8
BF 500 H$=""
EX 510 FORB=3TOV/8+2:AK$=""
RE 520 GOTO610
RE 530 FORG=1TO8:AK$=AK$+CHR$(
      0)+CHR$(0):FORZ=3TO30
HD 540 AK$=AK$+CHR$(ASC(MID$(Z
      $(G+(B-3)*8),Z,1)+CHR$(
      0))):NEXT Z,G:PRINT LEN
      (AK$)
XK 550 IFB<A/8+2THENPRINT#5,CH
      R$(40)+CHR$(B+1);:FORZ=
      1TO254
CX 560 PRINT#5,CHR$(ASC(MID$(A
      K$,Z,1)+CHR$(0)));:NEXT
      Z
CS 570 PRINT#15,"U2:";5;0;40;B
      :NEXTB:CLOSE 5
XX 580 IFB=V/8+2THENPRINT#5,CH
      R$(0)+CHR$(255);:FORZ=1
      TO254
FA 590 PRINT#5,CHR$(ASC(MID$(A
      K$,Z,1)+CHR$(0)));:NEXT
      Z:PRINT#15,"U2:";5;0;40
      ;B
AB 600 NEXTB:CLOSE5
AK 610 PRINT#15,"B-P:";5;0:IFB
      <V/8+2THENPRINT#5,CHR$(
      40)+CHR$(B+1);
AH 620 IFB=V/8+2THENPRINT#5,CH
      R$(0)+CHR$(255);
AM 630 FORZ=1TO30:PRINT#5,CHR$
      (ASC(MID$(Z$(1+(B-3)*8)
      ,Z,1)+CHR$(0)));:NEXTZ
SE 640 FORG=2TO8:PRINT#5,CHR$(
      0)+CHR$(0);:FORZ=1TO30
CK 650 PRINT#5,CHR$(ASC(MID$(Z
      $(G+(B-3)*8),Z,1)+CHR$(
      0)));:NEXTZ,G
XQ 660 PRINT#15,"U2:";5;0;40;B
      :NEXTB
PQ 670 CLOSE 5:CLOSE 15:PRINT"
      {YEL}COLLECTING DISK...
      {DOWN}":OPEN15,D,15,"V
      0:": CLOSE15
PX 680 PRINT"{DOWN}DO YOU WANT
       TO TRY ANOTHER? {RVS}
      {SPACE}{OFF}{LEFT}";
BH 690 GETA$:IFA$<>"Y"ANDA$<>"
      N"THEN690
FK 700 PRINTA$:IFA$="Y" THEN C
      LR:GOTO20
KC 710 END
DX 720 PRINT"{2 DOWN}{YEL}WOUL
      D YOU LIKE TO EDIT THIS
       ORDER? {RVS} {OFF}
      {LEFT}";:K=1
XQ 730 GETA$:IFA$<>"Y"ANDA$<>"
      N"THEN730
SB 740 IF A$="N"THEN RETURN
EA 750 JJ=24:IFV-K<24THENJJ=V-
      K+1
SA 760 PRINT"{CLR}{YEL}";:FORA
      =1TOJJ:
CS 770 PRINTCHR$(34)+MID$(Z$(A
      +K-1),4,16)+CHR$(34):NE
      XT
QC 780 PRINT"{HOME}{YEL}"+LEFT
      $("{RIGHT}{23 DOWN}",O+
      1)+"{RED}"+MID$(Z$(K+O)
      ,4,16);
CD 790 GET A$:IFA$=""THEN790
XQ 800 IFA$="-"AND K-24>=1 THE
      NK=K-24:O=0:GOTO750
ME 810 IFA$="+"AND K+24<=V THE
      NK=K+24:O=0:GOTO750
AD 820 IF A$="{DOWN}" AND O<JJ
      -1THEN GOSUB1030:O=O+1:
      GOTO780
RF 830 IF A$="{UP}" AND O>0 TH
      EN GOSUB1030:O=O-1:GOTO
      780
RS 840 IFA$="P"AND P=0 THEN P=
      1:GOSUB890:GOTO750
XM 850 IF A$="Q" THEN RETURN
BS 860 GOTO790
AA 870 GET A$:IFA$<>"Y"ANDA$<>
      "N"THEN870
CR 880 END
DS 890 SI$=Z$(K+O):FORA=K+O TO
       V-1:Z$(A)=Z$(A+1):NEXT
EX 900 Z$(V)="{32 SPACES}"
XH 910 JJ=24:IFV-K<24THENJJ=V-
      K+1
PB 920 PRINT"{CLR}{YEL}";:FORA
      =1TOJJ
XE 930 PRINTCHR$(34)+MID$(Z$(A
      +K-1),4,16)+CHR$(34):NE
      XT
HF 940 PRINT"{HOME}"+LEFT$("
      {RIGHT}{23 DOWN}",O+1)+
      "{RVS}{RED}"+MID$(Z$(K+
      O),4,16)+"{OFF}";
SK 950 GET A$:IFA$=""THEN950
ER 960 IFA$="-"AND K>1 THENK=K
      -24:O=0:GOTO910
BB 970 IFA$="+"AND K+24<=V THE
      NK=K+24:O=0:GOTO910
HG 980 IF A$="{DOWN}" AND O<JJ
      -1 THEN GOSUB1030:O=O+1
      :GOTO940
GA 990 IF A$="{UP}" AND O>0 TH
      EN GOSUB1030:O=O-1:GOTO
      940
QD 1000 IFA$="P"AND P=1 THEN P
      =0:GOTO1020
KS 1010 GOTO950
FA 1020 FORA=V-1 TO K+OSTEP-1:
      Z$(A+1)=Z$(A):NEXT:Z$(
      K+O)=SI$:SI$="":RETURN
HK 1030 PRINT"{HOME}"+LEFT$("
      {RIGHT}{23 DOWN}",O+1)
      +"{YEL}"+MID$(Z$(K+O),
      4,16);
DA 1040 RETURN
FM 1050 IFA$=O$ORASC(LEFT$(A$,
      1))<129 THEN RETURN
JB 1060 IFV<>0THENFORB=1TOV:IF
      MID$(A$,4,16)>MID$(Z$(
      B),4,16)THEN NEXT
QR 1070 PRINT".";:FORC=V+1TOBS
      TEP-1:Z$(C)=Z$(C-1):NE
      XT:Z$(B)=A$:IFV<296THE
      NV=V+1
XF 1080 RETURN
```

Arcade Machine

See instructions in article on page 53 before typing in.

Program 1: Arcade Machine

```
0801:0B 08 00 00 9E 32 30 36 EC
0809:31 00 00 00 A2 05 A0 00 1C
0811:98 99 00 75 C8 D0 FA EE 99
0819:14 08 CA 10 F4 A9 00 85 63
0821:37 A9 60 85 38 A2 14 A0 B0
0829:00 B9 45 08 99 00 60 C8 27
0831:D0 F7 EE 2C 08 EE 2F 08 AA
0839:CA D0 EE 20 00 60 20 44 C8
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0F81:76 18 7D BC 02 9D BC 02 5E
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1649:C9 38 B0 1E C9 30 90 1A AA
1651:E9 30 AA AD 15 D0 3D D6 EB
1659:6B F0 06 20 94 69 4C DB F8
1661:6D 20 83 6F 20 C9 69 4C FA
1669:DB 6D C9 91 D0 08 A5 29 4C
1671:F0 AD C6 29 10 A9 C9 11 B8
1679:D0 0C AD 03 74 18 E5 29 EF
1681:F0 9D E6 29 10 99 C9 9D 15
1689:D0 08 A5 2A F0 48 C6 2A D7
1691:10 44 C9 1D D0 0C AD 02 F5
1699:74 18 E5 2A F0 38 E6 2A C5
16A1:10 34 C9 2D F0 0F C9 DB 22
16A9:F0 0E C9 DD F0 0D C9 2B 63
16B1:D0 27 A9 01 2C A9 FF 2C 89
16B9:A9 0A 2C A9 F6 85 69 20 1E
16C1:64 6F 18 65 69 85 69 A4 2E
16C9:29 BE 04 74 F0 04 E4 69 CC
16D1:90 04 A4 2A 91 22 4C DB 08
16D9:6D C9 86 D0 0E A5 26 C9 2A
16E1:11 90 03 4C F9 6C 69 01 35
16E9:4C FB 6C C9 85 D0 0F A5 98
16F1:26 D0 05 A9 11 4C FB 6C BE
16F9:38 E9 01 4C FB 6C C9 03 C9
1701:F0 0E C9 88 D0 10 A9 00 07
1709:85 04 20 7A 6F 4C DB 6D 78
1711:4E 91 02 4C 44 E5 C9 87 A4
1719:D0 0B A2 07 20 94 69 CA 28
1721:10 FA 4C DB 6D C9 20 D0 01
1729:AD A5 26 C9 05 D0 0C A6 23
1731:2A BD E0 78 30 A0 7E D8 61
1739:78 D0 9B C9 02 D0 97 A6 11
1741:2A E8 8E A7 02 4C 92 6E DF
1749:A5 2A 0A 0A 65 9E 69 05 34
1751:A8 A5 29 38 65 9F AA 18 FC
1759:20 F0 FF 20 64 6F A4 29 29
1761:BE 04 74 F0 07 A8 20 A2 4B
1769:B3 4C 2B 6F 20 3C BC 20 6C
1771:DD BD 20 46 6F A9 00 A0 29
1779:01 85 22 84 23 A0 00 B1 63
1781:22 F0 06 20 16 E7 C8 D0 72
1789:F6 60 AD 02 01 D0 03 20 92
1791:53 6F AD 03 01 D0 10 A2 39
1799:02 BD 01 01 9D 02 01 CA 2A
17A1:10 F7 A9 30 8D 01 01 60 E0
17A9:A5 29 0A 0A 0A 6D 00 74 51
17B1:85 22 AD 01 74 69 00 85 BF
17B9:23 A4 2A B1 22 60 A2 07 E1
17C1:20 83 6F CA 10 FA 60 20 C8
17C9:FD 6A 78 20 15 69 58 A9 4B
17D1:00 9D B8 78 BD 58 73 9D D9
17D9:BC 02 A9 D0 9D C4 02 20 4D
17E1:28 6A 4C C9 69 01 00 01 35
17E9:00 01 00 01 00 B9 BB BD 84
17F1:C1 C5 C9 CD D1 6F 6F 6F 23
17F9:6F 6F 6F 6F 6F D5 00 C3 37
1801:00 C9 9D 11 00 C2 9D 11 BF
1809:00 CB 9D 9D 00 C3 9D 9D A1
1811:00 CA 9D 91 00 C2 9D 91 98
1819:00 00 75 06 01 01 08 75 E9
1821:08 07 FF FF FF 0F 01 01 56
1829:01 40 75 08 09 04 5F 5F 8F
1831:FF FF 0F 0F 0F 0F 88 75 6F
1839:05 07 01 FF FF FF 01 00 CF
1841:00 C0 75 05 0D FF FF FF 09
1849:FF 0F 01 01 01 00 00 08 7D
1851:00 00 28 76 08 0A FF FF 56
1859:FF 0F 01 01 01 00 00 08 8D
1861:78 76 08 08 09 09 09 09 74
```

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1869:09 09 09 09 B8 76 08 08 C9
1871:08 08 08 08 08 08 08 08 A1
1879:F8 76 08 08 FF FF FF FF 45
1881:FF FF FF FF 38 77 08 03 64
1889:09 08 FF 50 77 08 08 FF 31
1891:FF FF FF FF 00 00 03 90 58
1899:77 08 04 FF FF FF FF B0 B8
18A1:77 08 04 09 09 09 09 D0 EF
18A9:77 08 04 08 08 08 08 F0 F9
18B1:77 08 04 FF FF FF FF 10 30
18B9:78 08 01 01 18 78 08 08 13
18C1:FF FF FF FF FF 00 00 03 F4
18C9:5A 78 05 07 FF 03 00 7F E1
18D1:08 00 00 2B 50 00 2B 4C DD
18D9:50 89 89 89 91 9E C2 C2 AD
18E1:C2 C2 2B BE DE 57 41 56 A2
18E9:C5 4E 4F 54 45 B1 4E 4F 9C
18F1:54 45 B2 54 45 4D 50 CF 09
18F9:54 49 4D C5 41 54 54 43 F3
1901:CB 44 45 43 41 D9 53 55 74
1909:53 54 CE 52 45 4C 53 C5 C0
1911:45 4E 41 42 CC 42 4C 4F 1D
1919:43 CB 4A 49 46 46 D3 46 F6
1921:52 4D 45 D3 53 50 44 45 5F
1929:CE 58 53 50 C4 59 53 50 CA
1931:C4 54 49 4D C5 42 4C 4F F7
1939:43 CB 4A 49 46 46 D3 46 17
1941:52 4D 45 D3 43 4F 4C 4F 15
1949:D2 4D 4F 44 C5 58 53 49 E5
1951:5A C5 59 53 49 5A C5 58 1A
1959:4F 46 46 D3 59 4F 46 46 A5
1961:D3 53 4F 55 4E C4 58 53 1B
1969:50 C4 59 53 50 C4 B0 B1 FD
1971:B2 B3 B4 B5 B6 B7 41 43 36
1979:54 CE 53 4F 55 4E C4 50 A6
1981:4E 54 D3 44 45 4C 41 D9 66
1989:58 50 4F D3 2B 52 4E C4 27
1991:59 50 4F D3 2B 52 4E C4 AF
1999:58 53 50 C4 59 53 50 C4 A0
19A1:2B 2F AD 54 49 4D C5 54 8F
19A9:4F D0 42 4F 54 54 CD 4C D0
19B1:45 46 D4 52 49 47 48 D4 A4
19B9:58 53 50 C4 59 53 50 C4 C0
19C1:2B 2F AD 52 41 54 C5 44 5B
19C9:49 52 45 C3 41 49 CD 53 38
19D1:50 45 45 C4 53 4F 55 4E 43
19D9:C4 58 4F 46 46 D3 59 4F 56
19E1:46 46 D3 C3 E1 06 2B 2B 28
19E9:E1 E1 E1 E1 E1 E1 E1 E1 1C
19F1:E1 E1 E1 44 45 71 71 72 53
19F9:72 72 71 71 71 71 71 71 EC
1A01:71 71 71 71 71 72 72 4F 19
1A09:50 54 3A 20 20 4A 4F 59 E5
1A11:20 43 4F 4C 20 52 50 4C 0C
1A19:20 42 44 52 20 52 4E 44 C6
1A21:20 46 49 52 00 53 50 52 85
1A29:3A 20 20 20 30 20 20 20 EA
1A31:31 20 20 20 32 20 20 20 7E
1A39:33 20 20 20 34 20 20 20 97
1A41:35 20 20 20 36 20 20 20 B0
1A49:37 00 20 20 20 20 20 20 01
1A51:53 31 20 20 53 32 20 20 45
1A59:53 33 20 20 53 34 20 20 D5
1A61:53 35 20 20 53 36 20 20 66
1A69:53 37 20 20 53 38 00 4A E0
1A71:4F 59 3A 20 43 4E 54 52 3B
1A79:20 55 50 20 20 44 57 4E 2E
1A81:20 4C 46 54 20 52 47 54 14
1A89:00 53 50 52 3A 20 20 20 74
1A91:32 20 20 20 33 20 20 20 67
1A99:34 20 20 20 35 20 20 20 80
1AA1:36 00 82 8B 9A A0 A9 B7 5C
1AA9:C5 BF D2 E6 FD 32 28 05 87
1AB1:16 3A 41 4D 72 72 72 72 31
1AB9:72 72 72 72 72 72 72 73 EE
1AC1:73 73 73 73 73 73 08 4F FA
1AC9:50 54 49 4F 4E 53 00 44 5D
1AD1:45 46 49 4E 45 20 53 50 E9
1AD9:52 49 54 45 53 00 53 4F F8
1AE1:55 4E 44 00 4A 4F 59 53 72
1AE9:54 49 43 4B 00 4A 4F 59 D8
1AF1:53 54 49 43 4B 20 46 49 F2
1AF9:52 45 00 45 58 50 4C 4F E8
1B01:44 45 00 53 4F 55 4E 44 90
1B09:20 4F 4E 20 43 4F 4C 4C 2B
1B11:49 53 49 4F 4E 00 50 4F 41
1B19:49 4E 54 53 20 4F 4E 20 42
1B21:43 4F 4C 4C 49 53 49 4F 94
1B29:4E 00 53 50 52 49 54 45 9B
1B31:2F 44 41 54 41 20 43 4F DD
1B39:4C 4C 49 53 49 4F 4E 53 7E
1B41:00 52 45 50 4C 41 43 45 EC
1B49:00 53 4F 55 4E 44 20 41 98
1B51:54 20 42 4F 52 44 45 52 77
1B59:53 00 50 4F 49 4E 54 53 B7
1B61:20 41 54 20 42 4F 52 44 BC
1B69:45 52 53 00 41 43 54 49 4A
1B71:4F 4E 20 41 54 20 42 4F F1
1B79:52 44 45 52 53 00 45 4E 2B
1B81:41 42 4C 45 20 52 41 4E E1
1B89:44 4F 4D 20 4D 4F 56 45 FA
1B91:00 45 4E 45 4D 59 20 46 8D
1B99:49 52 45 00 10 24 38 4C 7F
1BA1:60 74 88 9C 00 00 00 00 FF
```

Program 2: Boot

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
FE 20 POKE53280,14:POKE53281,6
      :PRINT"{CLR}{7}
      {3 SPACES}COPYRIGHT 1989
       COMPUTE! PUB., INC."
CA 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
JK 40 PRINT"{DOWN}: LOADING AR
      CADE MACHINE"
RX 50 A$=CHR$(34)
RC 60 PRINT"{HOME}{5 DOWN}
      {BLU}PRINTCHR$(147):DLOA
      D"A$"SPRDATA"A$":DLOAD"A
      $"PARAMS"A$;
SX 70 PRINT":PRINT"A$"{CLR}ARC
      ADE MACHINE ACTIVATED"A$
      "{7}{HOME}{2 DOWN}"
CG 80 POKE631,13:POKE198,2
RE 90 LOAD"ARCADE MACHINE",8
```

Program 3: Sprdata

```
30C0:00 30 00 00 FC 00 00 FC 12
30C8:00 00 FC 00 00 FC 00 00 BC
30D0:FC 00 00 FC 00 00 FC 00 79
30D8:00 FC 00 00 FC 00 00 FC 5D
30E0:00 00 FC 00 03 FF 00 03 FB
30E8:FF 00 03 FF 00 00 54 00 52
30F0:00 54 00 00 10 00 00 10 F6
30F8:00 00 00 00 00 00 00 00 59
3100:00 30 00 00 FC 00 00 FC 53
3108:00 00 FC 00 00 FC 00 00 FD
3110:FC 00 00 FC 00 00 FC 00 BA
3118:00 FC 00 00 FC 00 00 FC 9E
3120:00 00 FC 00 03 FF 00 03 3D
3128:FF 00 03 FF 00 00 54 00 93
3130:00 54 00 00 54 00 00 54 9E
3138:00 00 10 00 00 10 00 00 DC
3140:00 00 00 00 00 00 00 00 A2
3148:00 00 00 00 00 00 00 00 AA
3150:00 00 00 00 00 00 00 00 B2
3158:00 00 00 00 00 00 00 00 BA
3160:00 00 00 00 00 00 00 00 C2
3168:00 00 00 00 00 00 00 00 CA
3170:00 00 00 00 00 00 00 00 D2
3178:00 00 30 00 00 DC 00 00 54
3180:00 00 00 00 00 00 00 00 E2
3188:00 00 00 00 00 00 00 00 EA
3190:00 00 00 00 00 00 00 00 F2
3198:00 00 00 00 00 00 00 00 FA
31A0:00 00 00 00 00 00 00 00 03
31A8:00 00 00 30 00 03 33 00 80
31B0:00 FC 00 03 DF 00 00 DC 5E
31B8:00 03 DF 00 00 DC 00 00 4B
31C0:00 00 00 00 00 00 00 00 23
31C8:00 00 00 00 00 00 00 00 2B
31D0:00 00 00 00 00 00 00 00 33
31D8:00 00 00 00 30 00 00 00 BC
31E0:00 03 33 00 00 DC 00 0C E9
31E8:DC C0 03 57 00 0F 77 C0 AB
31F0:03 77 00 0F 77 C0 03 77 DF
31F8:00 0F CF C0 03 33 00 00 0A
3200:00 00 00 00 00 00 00 00 64
3208:00 00 00 00 00 00 00 00 6C
3210:30 00 00 CC 00 03 33 00 CB
3218:00 FC 00 0F FF C0 03 DF 95
3220:00 3F 77 F0 0F DF C0 3F 0B
3228:77 F0 0D FD C0 3F 77 F0 E8
3230:0D FD C0 3F FF F0 0D CD 52
3238:C0 03 33 00 00 CC 00 00 57
3240:00 00 00 00 00 00 00 30 D4
3248:00 00 FC 00 0C CC C0 03 64
3250:33 00 30 CC 30 0F FF C0 9F
3258:C3 33 0C 3C FC F0 CF 33 2F
3260:CC 33 CF 30 CF 33 CC 33 0D
3268:03 30 0C FC C0 33 03 30 B4
3270:0C FC C0 03 03 00 0C CC 5F
3278:C0 03 03 00 00 00 00 00 5E
3280:00 00 00 00 00 00 00 30 15
3288:00 00 CC 00 00 00 00 00 86
3290:00 00 C3 33 0C 0C 00 C0 F1
3298:00 CC 00 C0 00 0C 0C 00 84
32A0:C0 00 30 00 30 00 30 03 50
32A8:03 00 00 00 00 30 00 30 7F
32B0:00 00 00 03 03 00 00 00 5D
32B8:00 00 00 00 00 00 00 00 1D
32C0:00 00 00 00 00 00 00 00 25
32C8:00 00 00 00 00 30 00 00 ED
32D0:00 00 03 03 00 00 00 00 C5
32D8:00 00 00 00 30 00 00 00 BE
32E0:00 30 00 30 00 00 00 00 54
32E8:00 00 00 30 00 00 00 00 50
32F0:0C 00 C0 00 00 00 00 00 73
32F8:00 00 00 00 00 00 00 00 5D
3300:00 00 00 00 00 00 00 00 66
3308:00 00 00 00 00 00 00 00 6E
3310:00 00 00 00 00 00 30 00 D6
3318:00 00 00 0C 00 C0 00 00 42
3320:00 00 00 00 00 30 00 00 47
3328:00 00 C0 00 0C 00 00 00 07
3330:00 00 00 00 30 00 00 00 18
3338:00 00 00 00 00 00 00 00 9E
3340:00 00 00 00 00 00 00 00 A6
3348:00 00 00 00 00 00 00 00 AE
3350:00 00 00 00 00 00 00 00 B6
3358:00 00 00 00 00 00 00 00 BE
3360:00 00 30 00 00 00 00 30 FC
3368:00 30 00 00 00 00 00 00 DA
3370:00 30 00 00 00 00 C0 00 64
3378:0C 00 00 00 00 00 00 00 E4
3380:00 00 00 00 00 00 00 00 E6
3388:00 00 00 00 00 00 00 00 EE
3390:00 00 00 00 00 00 00 00 F6
3398:00 00 00 00 00 00 00 00 FE
33A0:00 00 00 00 00 00 00 00 07
33A8:00 00 00 00 00 00 30 00 6F
33B0:00 00 00 C0 00 0C 00 00 53
33B8:00 00 00 00 00 30 00 00 DF
33C0:00 00 00 00 00 00 00 00 27
33C8:00 00 00 00 00 00 00 00 2F
33D0:00 00 00 00 00 00 00 00 37
33D8:00 00 00 00 00 00 00 00 3F
33E0:00 00 00 00 00 00 00 00 47
33E8:00 00 00 00 00 00 00 00 4F
33F0:00 00 00 00 00 00 00 30 87
33F8:00 00 00 00 C0 00 0C 00 7D
3400:0F 00 00 00 C0 00 00 C0 B6
3408:00 00 30 00 00 30 00 00 37
3410:30 00 0A 32 80 2A BA A0 B7
3418:2A BA A0 AA AA A8 AA AA FA
3420:A8 AA AA A8 AA AA A8 AA 63
3428:AA A8 2A AA A0 2A AA A0 A3
3430:2A AA A0 2A AA A0 0A AA A5
3438:80 0A AA 80 02 8A 00 00 FA
3440:00 00 00 00 00 00 00 00 A8
3448:00 00 00 00 FF FE 00 01 AD
3450:00 00 03 C0 02 0C F0 04 4B
3458:10 FF F8 10 FC 10 0F E0 10
3460:20 04 40 00 88 20 00 7F 26
3468:FC 00 00 00 00 00 00 00 4F
3470:00 00 00 00 00 00 00 00 D8
3478:00 00 00 00 00 00 00 00 E0
3480:00 00 00 00 00 00 00 00 E8
3488:00 00 00 00 07 C0 00 01 2D
```

```
3490:00 00 03 C0 20 0C F0 10 88
3498:10 FF F8 10 FC 04 0F E0 20
34A0:02 04 40 00 88 20 00 7F 57
34A8:FC 00 00 00 00 00 00 00 8F
34B0:00 00 00 00 00 00 00 00 19
34B8:00 00 00 00 00 00 00 00 21
34C0:00 00 00 00 00 00 00 00 29
34C8:00 00 00 00 0F FF E0 00 6B
34D0:10 00 00 38 00 00 44 00 4D
34D8:00 44 00 00 7C 00 00 38 6E
34E0:00 00 44 00 00 82 00 01 DC
34E8:C7 00 00 00 00 00 00 00 35
34F0:00 00 00 00 00 00 00 00 59
34F8:00 00 00 00 00 00 00 00 61
3500:00 00 00 00 00 00 00 00 6A
3508:00 00 00 00 00 7C 00 00 64
3510:10 00 00 38 00 00 44 00 8E
3518:00 44 00 00 7C 00 00 38 AF
3520:00 00 44 00 00 82 00 01 1E
3528:C7 00 00 00 00 00 00 00 76
3530:00 00 00 00 00 00 00 00 9A
3538:00 00 00 00 00 00 00 00 A2
3540:00 00 00 00 00 00 00 00 AA
3548:00 00 00 00 00 7F FF 00 B0
3550:00 80 40 03 C0 20 0F 30 E7
3558:1F FF 08 08 3F 08 04 07 FC
3560:F0 00 02 20 00 04 11 00 B7
3568:3F FE 00 00 00 00 00 00 32
3570:00 00 00 00 00 00 00 00 DA
3578:00 00 00 00 00 00 00 00 E2
3580:00 00 00 00 00 00 00 00 EA
3588:00 00 00 00 00 03 E0 00 C0
3590:00 80 04 03 C0 08 0F 30 40
3598:1F FF 08 20 3F 08 40 07 37
35A0:F0 00 02 20 00 04 11 00 F7
35A8:3F FE 00 00 00 00 00 00 72
35B0:00 00 00 00 00 00 00 00 1B
35B8:00 00 00 00 00 00 00 00 23
35C0:00 00 00 00 00 00 00 00 2B
35C8:00 00 00 00 00 00 00 00 33
35D0:10 00 00 54 00 00 DC 00 42
35D8:00 F8 00 00 F8 00 00 20 69
35E0:00 00 20 00 00 20 00 00 CF
35E8:20 00 00 20 00 00 20 00 A5
35F0:00 20 00 00 00 00 00 00 63
35F8:00 00 00 00 00 00 00 00 63
3600:00 00 00 00 00 00 00 00 6C
3608:00 00 10 00 00 10 00 00 B6
3610:54 00 00 54 00 00 DC 00 A5
3618:00 F8 00 00 F8 00 00 20 AA
3620:00 00 20 00 00 20 00 00 11
3628:20 00 00 20 00 00 20 00 E6
3630:00 20 00 00 00 00 00 00 A4
3638:00 00 00 00 00 00 00 00 A4
3640:00 00 00 00 00 00 00 00 AC
3648:00 00 00 00 00 00 00 00 B4
3650:00 00 00 00 00 00 00 00 BC
3658:00 00 00 01 7C 00 05 5F 22
3660:FC 01 7C 00 00 00 00 00 1B
3668:00 00 00 00 00 00 00 00 D4
3670:00 00 00 00 00 00 00 00 DC
3678:00 00 00 00 00 00 00 00 E4
3680:00 00 00 00 00 00 00 00 EC
3688:00 00 00 00 00 00 00 00 F4
3690:00 00 00 00 00 00 00 00 FC
3698:00 00 00 00 7C 00 01 5F 4A
36A0:FC 00 7C 00 00 00 00 00 1B
36A8:00 00 00 00 00 00 00 00 15
36B0:00 00 00 00 00 00 00 00 1D
36B8:00 00 00 00 00 00 00 00 25
36C0:00 00 00 00 00 00 00 00 2D
36C8:00 00 00 00 00 00 00 00 35
36D0:00 00 00 00 00 00 00 00 3D
36D8:00 00 00 00 3D 40 3F F5 A4
36E0:50 00 3D 40 00 00 00 00 21
36E8:00 00 00 00 00 00 00 00 55
36F0:00 00 00 00 00 00 00 00 5D
36F8:00 00 00 00 00 00 00 00 65
3700:00 00 00 00 00 00 00 00 6E
3708:00 00 00 00 00 00 00 00 76
3710:00 00 00 00 00 00 00 00 7E
3718:00 00 00 00 3D 00 3F F5 E4
3720:40 00 3D 00 00 00 00 00 56
3728:00 00 00 00 00 00 00 00 96
3730:00 00 00 00 00 00 00 00 9E
3738:00 00 00 00 00 00 00 00 A6
3740:00 00 00 00 00 00 00 00 AE
3748:00 00 00 00 00 00 00 00 B6
3750:00 00 00 00 00 00 00 00 BE
3758:88 88 88 DD DD DD FF FF 82
3760:FF 77 77 6D 42 22 44 00 95
3768:00 00 00 00 00 00 00 00 D6
3770:00 00 00 00 00 00 00 00 DE
3778:00 00 00 00 00 00 00 00 E6
3780:00 00 00 00 00 00 00 00 EE
3788:00 00 00 00 00 00 00 00 F6
3790:00 00 00 00 00 00 00 00 FE
3798:22 22 22 77 77 77 FF FF F5
37A0:FF 5D DD DB 10 88 91 00 A5
37A8:00 00 00 00 00 00 00 00 17
37B0:00 00 00 00 00 00 00 00 1F
37B8:00 00 00 00 00 00 00 00 27
37C0:00 00 00 00 00 00 00 1E 4D
37C8:00 00 78 00 00 1E 00 00 BE
37D0:78 00 00 1E 00 00 78 00 4E
37D8:00 1E 00 00 78 00 00 1E B0
37E0:00 00 78 00 00 1E 00 00 D6
37E8:78 00 00 1E 00 00 78 00 66
37F0:00 1E 00 00 78 00 00 1E C8
37F8:00 00 00 00 00 00 00 00 67
3800:00 00 00 00 00 00 00 78 E8
3808:00 00 1E 00 00 78 00 00 1E
3810:1E 00 00 78 00 00 1E 00 53
3818:00 78 00 00 1E 00 00 78 10
3820:00 00 1E 00 00 78 00 00 36
3828:1E 00 00 78 00 00 1E 00 6B
3830:00 78 00 00 1E 00 00 78 28
3838:00 00 00 00 00 00 00 00 A8
3840:00 00 00 00 00 00 00 00 B0
3848:00 00 00 00 00 AA 00 00 63
3850:AA 00 00 AA 00 00 AA 00 16
3858:02 AA 80 0A AA A0 2A AA FB
3860:A8 AA AA AA FF FF FF C3 93
3868:0C 30 00 00 00 00 00 00 EA
3870:00 00 00 00 00 00 00 00 E0
3878:00 00 00 00 00 00 00 00 E8
3880:00 00 00 00 00 00 00 00 F0
3888:00 00 00 00 00 AA 00 00 A3
3890:AA 00 00 AA 00 00 AA 00 56
3898:02 AA 80 0A AA A0 2A AA 3C
38A0:A8 AA AA AA FF FF FF 30 40
38A8:C3 0C 00 00 00 00 00 00 FD
38B0:00 00 00 00 00 00 00 00 21
38B8:00 00 00 00 00 00 00 00 29
38C0:00 00 00 00 00 00 00 00 31
38C8:00 00 00 00 00 AA 00 00 E3
38D0:AA 00 00 AA 00 00 AA 00 96
38D8:02 AA 80 0A AA A0 2A AA 7C
38E0:A8 AA AA AA FF FF FF 0C 5C
38E8:30 C3 00 00 00 00 00 00 62
38F0:00 00 00 00 00 00 00 00 61
38F8:00 00 00 00 00 00 00 00 69
3900:00 18 00 00 3C 00 00 3C 96
3908:00 00 3C 00 00 3C 00 00 F2
3910:3C 00 00 7E 00 01 FF 80 0D
3918:07 FF E0 1F FF F8 7F FF FE
3920:FE FF FF FF F8 3C 1F 00 09
3928:3C 00 00 3C 00 00 3C 00 F4
3930:00 7E 00 01 FF 80 03 FF 5A
3938:C0 00 3C 00 00 18 00 00 F2
3940:00 18 00 00 3C 00 03 FF A0
3948:C0 01 FF 80 00 7E 00 00 5D
3950:3C 00 00 3C 00 00 3C 00 1D
3958:F8 3C 1F FF FF FF 7F FF 39
3960:FE 1F FF F8 07 FF E0 01 A4
3968:FF 80 00 7E 00 00 3C 00 5B
3970:00 3C 00 00 3C 00 00 3C 10
3978:00 00 3C 00 00 18 00 00 D2
3980:00 00 00 00 06 00 00 0E 31
3988:00 00 1E 00 00 3E 00 00 B7
3990:7C 00 00 FC 04 01 FC 0C 3B
3998:01 FC 1C 7F FF FE FF FF 42
39A0:FF 7F FF FE 01 FC 1C 01 18
39A8:FC 0C 00 FC 04 00 7C 00 85
39B0:00 3E 00 00 1E 00 00 0E B1
39B8:00 00 06 00 00 00 00 00 EB
39C0:00 00 00 00 60 00 00 70 A6
39C8:00 00 78 00 00 7C 00 00 3C
39D0:3E 00 20 3F 00 30 3F 80 1A
39D8:38 3F 80 7F FF FE FF FF 3B
39E0:FF 7F FF FE 38 3F 80 30 13
39E8:3F 80 20 3F 00 00 3E 00 8F
39F0:00 7C 00 00 78 00 00 70 B6
39F8:00 00 60 00 00 00 00 00 77
3A00:00 00 00 00 00 00 00 00 74
3A08:00 00 00 00 00 00 00 00 7C
3A10:00 00 00 00 00 00 00 00 84
3A18:01 00 40 01 00 40 01 00 28
3A20:40 01 00 40 03 00 C0 03 95
3A28:00 C0 03 00 C0 03 00 C0 FF
3A30:03 00 C0 03 00 C0 00 00 71
3A38:00 00 00 00 00 00 00 00 AC
3A40:00 00 00 00 00 00 00 00 B4
3A48:00 00 00 00 00 00 00 00 BC
3A50:00 00 00 00 00 00 00 00 C4
3A58:01 00 40 01 00 40 01 00 68
3A60:40 01 00 40 03 00 C0 03 D5
3A68:00 C0 03 00 C0 03 00 C0 40
3A70:00 00 00 00 00 00 00 00 E4
3A78:00 00 00 00 00 00 00 00 EC
3A80:00 00 00 00 00 00 00 00 F4
3A88:00 03 00 C0 03 00 C0 03 66
3A90:00 C0 03 00 C0 03 00 C0 68
3A98:03 00 C0 01 00 40 01 00 B9
3AA0:40 01 00 40 01 00 40 00 02
3AA8:00 00 00 00 00 00 00 00 1D
3AB0:00 00 00 00 00 00 00 00 25
3AB8:00 00 00 00 00 00 00 00 2D
3AC0:00 00 00 00 00 00 00 00 35
3AC8:00 00 00 00 00 00 00 03 40
3AD0:00 C0 03 00 C0 03 00 C0 A8
3AD8:03 00 C0 01 00 40 01 00 F9
3AE0:40 01 00 40 01 00 40 00 42
3AE8:00 00 00 00 00 00 00 00 5D
3AF0:00 00 00 00 00 00 00 00 65
3AF8:00 00 00 00 00 00 00 00 6D
3B00:00 00 00 00 00 00 00 00 76
3B08:00 00 00 00 00 00 00 00 7E
3B10:00 00 00 00 00 00 57 FC 32
3B18:00 00 00 00 00 00 00 00 8E
3B20:00 00 00 00 00 00 00 00 96
3B28:57 FC 00 00 00 00 00 00 89
3B30:00 00 00 00 00 00 00 00 A6
3B38:00 00 00 00 00 00 00 00 AE
3B40:00 00 00 00 00 00 00 00 B6
3B48:00 00 00 00 00 00 00 00 BE
3B50:00 00 00 00 00 00 5F C0 46
3B58:00 00 00 00 00 00 00 00 CE
3B60:00 00 00 00 00 00 00 00 D6
3B68:5F C0 00 00 00 00 00 00 BE
3B70:00 00 00 00 00 00 00 00 E6
3B78:00 00 00 00 00 00 00 00 EE
3B80:00 00 00 00 00 00 00 00 F6
3B88:00 00 00 00 00 00 00 00 FE
3B90:00 00 00 00 00 3F D5 00 AF
3B98:00 00 00 00 00 00 00 00 0F
3BA0:00 00 00 00 00 00 00 3F 56
3BA8:D5 00 00 00 00 00 00 00 0A
3BB0:00 00 00 00 00 00 00 00 27
3BB8:00 00 00 00 00 00 00 00 2F
3BC0:00 00 00 00 00 00 00 00 37
3BC8:00 00 00 00 00 00 00 00 3F
3BD0:00 00 00 00 00 03 F5 00 3F
3BD8:00 00 00 00 00 00 00 00 4F
3BE0:00 00 00 00 00 00 00 03 5A
3BE8:F5 00 00 00 00 00 00 00 5A
3BF0:00 00 00 00 00 00 00 00 67
3BF8:00 00 00 00 00 00 00 00 6F
3C00:00 00 00 00 00 00 00 00 78
3C08:00 00 00 00 00 00 00 00 80
3C10:00 00 00 00 00 00 0C 00 A0
3C18:00 3F 00 00 37 00 00 37 51
3C20:00 00 3F 00 00 0C 00 00 B0
3C28:00 00 00 00 00 00 00 00 A0
3C30:00 00 00 00 00 00 00 00 A8
3C38:00 00 00 00 00 00 00 00 B0
3C40:00 00 00 00 00 00 00 00 B8
3C48:00 00 00 00 00 00 00 00 C0
3C50:00 00 00 CC C0 00 3F C0 DA
3C58:00 F7 00 00 15 C0 00 D5 50
3C60:00 00 37 C0 00 FF 00 00 CB
3C68:CF C0 00 0C 00 00 00 00 B9
3C70:00 00 00 00 00 00 00 00 E8
3C78:00 00 00 00 00 00 00 00 F0
3C80:00 00 00 00 00 00 00 00 F8
```

```
3C88:00 00 00 00 00 30 00 00 C1
3C90:CC C0 00 FF F0 03 1D C0 2E
3C98:00 F5 C0 03 17 F0 00 F5 49
3CA0:00 03 17 70 00 F4 30 00 F7
3CA8:FF C0 00 0C 00 00 3C 00 8A
3CB0:00 00 00 00 00 00 00 00 29
3CB8:00 00 00 00 00 00 00 00 31
3CC0:00 00 00 00 00 00 00 00 39
3CC8:00 00 CC 00 03 30 30 0C 20
3CD0:FF C0 00 F7 7C 33 1F F0 D8
3CD8:00 F5 CC 03 D7 70 33 7D FC
3CE0:CC 03 F7 70 0C DF 30 00 C6
3CE8:FF C0 0C 04 30 00 3F 10 63
3CF0:03 00 C0 00 CC 00 00 00 69
3CF8:00 00 00 00 00 00 00 00 71
3D00:00 00 00 00 00 00 0C 0C 9E
3D08:C0 30 CC 0C 33 3C F0 0D C2
3D10:D3 70 C0 C7 1C 33 14 C7 C2
3D18:0C F5 F3 03 13 7C 3C 77 3F
3D20:13 C3 33 7C 0C 1D F0 34 2E
3D28:F3 00 0C 37 3C 00 33 10 E9
3D30:03 0C CC 00 CC 00 0D 0C 55
3D38:C0 00 C0 00 00 00 00 00 2B
3D40:00 00 00 0C 33 00 00 0C 21
3D48:C0 30 40 0C 03 0C 40 0C CC
3D50:33 30 C0 C4 0C 30 30 C1 18
3D58:04 CC 33 03 01 CC 30 D3 0E
3D60:03 03 30 C4 0C 00 30 30 60
3D68:C3 00 04 1C 03 00 33 10 95
3D70:03 0C CC 00 00 00 33 0C 7B
3D78:C0 00 40 30 00 30 00 00 1F
3D80:00 00 00 0C 00 00 00 CC 88
3D88:00 00 00 3C 00 00 00 00 C6
3D90:03 30 C0 C0 00 10 00 C0 BD
3D98:00 30 00 03 00 0C 30 03 E2
3DA0:00 00 30 00 0C 00 13 00 A7
3DA8:CC 00 C0 00 30 00 03 00 29
3DB0:03 00 0C 00 00 00 31 0C 9C
3DB8:00 0C 00 00 00 03 00 00 42
3DC0:00 00 00 00 03 00 30 00 B3
3DC8:00 00 00 00 00 00 00 00 43
3DD0:00 0C 00 03 00 00 00 00 7E
3DD8:00 00 00 00 00 00 30 00 B3
3DE0:00 00 00 00 00 00 00 00 5B
3DE8:00 00 00 C0 00 00 00 03 72
3DF0:00 00 00 00 00 00 00 00 6B
3DF8:00 00 03 00 30 00 00 00 55
3E00:00 00 00 00 00 00 00 00 7C
3E08:00 00 00 00 00 00 00 2A AE
3E10:80 00 55 50 00 AA A8 00 78
3E18:55 54 00 0A AA 00 05 54 A8
3E20:00 02 AA 00 00 55 00 00 C7
3E28:0A 80 00 03 80 00 03 80 84
3E30:00 3F F0 00 3F F0 03 FF 5E
3E38:FF 01 FF FE 00 FF FC 00 DE
3E40:00 00 00 00 00 00 00 00 BC
3E48:00 00 00 00 00 00 00 15 D9
3E50:40 00 0A A0 00 55 54 00 36
3E58:2A A8 00 15 54 00 0A AA C6
3E60:00 00 55 00 00 AA 00 00 32
3E68:0D 00 00 03 80 00 03 80 26
3E70:00 3F F0 00 3F F0 03 FF 9E
3E78:FF 01 FF FE 00 FF FC 00 1F
```

Program 4: Params

```
7500:01 01 01 01 01 01 00 00 E7
7508:D5 EE F8 E1 E1 E1 E1 DF 11
7510:04 02 06 02 02 04 02 08 8A
7518:02 02 02 03 03 03 03 02 21
7520:05 00 07 0E 0D 0C 0B 07 05
7528:00 01 00 01 01 01 01 00 71
7530:00 00 01 00 00 00 00 00 3B
7538:00 00 00 00 00 00 00 00 23
7540:04 04 04 03 00 00 00 00 DE
7548:32 0A 5F 5F 00 00 00 00 B0
7550:00 00 00 00 00 00 00 00 3B
7558:0A 00 03 19 00 00 00 00 3A
7560:01 05 46 19 00 00 00 00 67
7568:00 00 0C 00 00 00 00 00 D4
7570:02 00 0B 00 00 00 00 00 BD
7578:0F 0F 02 0F 00 00 00 00 DF
7580:09 0A 0D 09 00 00 00 00 A4
7588:01 01 01 01 01 00 00 00 6C
7590:D3 00 00 D1 D5 00 00 00 31
7598:05 01 0A 00 00 00 00 00 87
75A0:02 02 02 00 00 00 00 00 4D
75A8:01 01 01 01 01 00 00 00 8C
75B0:00 00 00 FC 04 00 00 00 8B
75B8:00 FB 05 00 00 00 00 00 43
75C0:32 01 01 05 05 00 00 00 9D
75C8:D7 00 00 EC EE 00 00 00 E5
75D0:04 00 00 04 04 00 00 00 1E
75D8:02 00 00 02 02 00 00 00 F4
75E0:01 00 00 01 01 00 00 00 64
75E8:01 00 00 01 01 00 00 00 6C
75F0:00 00 00 01 01 00 00 00 F3
75F8:00 00 00 00 00 00 00 00 E3
7600:00 00 00 E9 0A 00 00 00 DB
7608:00 00 00 00 00 00 00 00 F4
7610:03 00 00 01 01 00 00 00 96
7618:00 00 00 CE 32 00 00 00 83
7620:05 00 00 00 00 00 00 00 8F
7628:F0 C5 F0 F0 F0 F0 F0 C5 1F
7630:0A 0A 0A 0A 0A 0A 0A 0A 1D
7638:08 0B 08 08 08 08 08 0B E8
7640:01 01 01 01 01 01 01 01 2D
7648:01 01 01 01 01 01 01 01 35
7650:01 01 01 01 01 01 01 01 3D
7658:01 01 01 01 01 01 01 01 45
7660:FB FC 02 F9 F9 F9 F9 FC 13
7668:F5 E4 FE F5 F5 F5 F5 E4 21
7670:02 02 02 02 02 02 02 02 5D
7678:00 00 03 03 03 03 03 03 23
7680:00 00 01 01 01 01 01 01 AC
7688:00 02 00 00 00 00 00 00 F5
7690:00 02 00 00 00 00 00 00 FD
7698:00 02 00 00 00 00 00 00 06
76A0:00 02 00 00 00 00 00 00 0E
76A8:00 02 00 00 00 00 00 00 16
76B0:00 02 00 00 00 00 00 00 1E
76B8:00 00 00 00 00 00 00 00 A5
76C0:00 00 00 00 00 00 00 00 AD
76C8:00 00 00 00 00 00 00 00 B5
76D0:00 00 00 00 00 00 00 00 BD
76D8:00 00 00 00 00 00 00 00 C5
76E0:00 00 00 00 00 00 00 00 CD
76E8:00 00 00 00 00 00 00 00 D5
76F0:00 00 00 00 00 00 00 00 DD
76F8:00 00 00 00 00 00 00 00 E5
7700:00 00 00 00 00 00 00 00 EE
7708:00 00 00 00 00 00 00 00 F6
7710:00 00 00 00 00 00 00 00 FE
7718:00 00 00 00 00 00 00 00 07
7720:00 00 00 00 00 00 00 00 0F
7728:00 00 00 00 00 00 00 00 17
7730:00 00 00 00 00 00 00 00 1F
7738:00 00 00 00 00 00 00 00 27
7740:00 00 00 00 00 00 00 00 2F
7748:00 00 00 00 00 00 00 00 37
7750:3C 00 3C 3C 3C 3C 3C 00 F3
7758:50 00 00 37 4B 5F 73 00 A1
7760:00 00 00 00 00 00 00 00 4F
7768:C8 00 E5 00 00 00 00 00 78
7770:00 00 00 00 00 00 00 00 5F
7778:00 00 02 00 00 00 00 00 A7
7780:00 00 00 04 04 04 04 00 E7
7788:00 00 00 00 00 00 00 00 77
7790:32 00 00 32 32 32 32 32 AC
7798:EC EC EB EB EB EB EB EB 48
77A0:0C F6 F0 0C 0C 0C 0C 0C E6
77A8:A0 AA B4 A0 A0 A0 A0 A0 9C
77B0:04 01 06 06 06 06 06 01 58
77B8:04 02 06 06 06 06 06 02 A1
77C0:04 01 00 07 07 07 07 01 C5
77C8:04 01 00 07 07 07 07 01 CD
77D0:00 00 00 00 00 00 00 00 BF
77D8:00 00 00 00 00 00 00 00 C7
77E0:00 00 00 00 00 00 00 00 CF
77E8:00 00 00 00 00 00 00 00 D7
77F0:00 00 00 00 00 00 00 00 DF
77F8:00 00 00 00 00 00 00 00 E7
7800:00 00 00 00 00 00 00 00 F0
7808:00 00 00 00 00 00 00 00 F8
7810:00 00 00 01 01 01 01 00 1F
7818:0A 0A 0A 00 00 00 00 00 D1
7820:32 32 32 00 00 00 00 00 FC
7828:50 50 50 00 00 00 00 00 5F
7830:00 00 00 00 00 00 00 00 21
7838:FF FF FF 00 00 00 00 00 29
7840:04 05 03 00 00 00 00 00 D4
7848:04 01 06 00 00 00 00 00 3C
7850:01 01 01 00 00 00 00 00 22
7858:00 00 FF 0A 0A 0A 0A 00 76
7860:00 00 00 01 01 01 01 00 6F
7868:00 00 06 00 00 00 00 00 1A
7870:00 00 06 0A 0A 0A 0A 00 4F
7878:00 00 03 03 03 03 03 00 24
7880:00 00 0A 00 00 00 00 00 B2
7888:00 00 03 00 00 00 00 00 D9
7890:07 01 00 00 00 00 00 00 45
```

Power BASIC:
Binary/Hex Enhancer

Article on page 60.

```
FH 10 REM COPYRIGHT 1989 COMPU
      TE! PUBLICATIONS, INC. -
       ALL RIGHTS RESERVED
HK 20 PRINT"{CLR}{3 SPACES}COP
      YRIGHT 1989 COMPUTE! PUB
      ., INC."
CA 30 PRINTTAB(11)"ALL RIGHTS
      {SPACE}RESERVED"
JC 40 PRINT"{2 DOWN}POKING ML
      {SPACE}DATA AT";
PQ 50 AD=PEEK(55)+256*PEEK(56)
      -119
GH 60 HI=INT(AD/256):LO=AD-HI*
      256
DB 70 POKE55,LO:POKE56,HI:CLR
SD 80 AD=PEEK(55)+256*PEEK(56)
DD 90 RESTORE:PRINTAD"....";
QA 100 FORI=0TO117:READX:POKEI
       +AD,X:Z=Z+X:NEXT
JB 110 IFZ<>11151THENPRINT:PRI
       NT"{DOWN}ERROR IN DATA
       {SPACE}STATEMENTS.":STO
       P
FH 120 X=AD+11:HI=INT(X/256):L
       O=X-HI*256
EA 130 POKEAD+1,LO:POKEAD+6,HI
KB 140 PRINT:PRINT"DONE!":SYSA
       D:NEW
BE 150 DATA 169,11,141,10,3,16
       9
EE 160 DATA 192,141,11,3,96,16
       9
SB 170 DATA 0,133,13,32,115,0
FX 180 DATA 8,201,37,240,8,201
RH 190 DATA 36,240,34,40,76,14
       1
SA 200 DATA 174,169,0,133,98,1
       33
KB 210 DATA 99,32,115,0,56,233
DB 220 DATA 48,201,2,176,11,6
FK 230 DATA 99,38,98,101,99,13
       3
FF 240 DATA 99,24,144,235,24,1
       44
PE 250 DATA 50,169,0,133,98,13
       3
FR 260 DATA 99,32,115,0,56,233
GH 270 DATA 48,201,23,176,237,
       201
FD 280 DATA 10,144,7,56,233,7
HD 290 DATA 201,10,144,226,6,9
       9
QK 300 DATA 38,98,6,99,38,98
SD 310 DATA 6,99,38,98,6,99
JX 320 DATA 38,98,101,99,133,9
       9
SP 330 DATA 24,144,212,162,144
       ,40
PD 340 DATA 56,76,73,188
```

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THE 1541 RAMBOard

We don't have to be first - we just have to be best!

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Such is the case with the RAMBOard. Even though we didn't originate the concept, we were able to create a second generation "superboard" that is easy to install, simple to use, and less expensive than the original. Our RAMBOard fits right inside your 1541 1541C drive. It works with special software to allow you to backup programs that other utilities can't even scratch the surface of. And as new copy protection schemes arrive, we'll develop new parameters to keep your RAMBOard operating behind enemy lines. Your RAMBOard also comes with a fast copier that can backup an unprotected disk in under 50 SECONDS!

The 1541 RAMBOard does require software to operate. This software can be RAMBOard parameters, now found on our Renegade ™ disks, or any of the other "superboard" type of software already on the market.

1541 RAMBOard Only $34.95

NEW - for those of you with Commodore's newest 5.25" drive:

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FLASH! Kracker Jax Earns a 5 Star Rating In INFO's May-June '88 Issue

Kracker Jax is the powerful parameter based copying system that has taken the country by storm! What IS a parameter? It's a custom program that allows your 1541 or 1571 disk drive to strip ALL copy protection from your expensive software, leaving you with UNPROTECTED, TOTALLY BROKEN BACKUPS that can even be copied with a simple fast copier!

We declare **Kracker Jax** to be the best system of its kind on the market today! A bold claim? Maybe.

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NEW LOW PRICE

ATTENTION C-128 OWNERS

Now that Commodore has released the C-128D with 64K of video RAM, we should be seeing 128 programs address this fantastic new feature soon.

BASIC 8 already has the capability of using all 64K of video RAM. If you own the C-128 in stock condition, you own all 16K of video RAM that Commodore felt was necessary. Using Basic 8 format and the full 64K of video RAM provides you with the ability to scroll through video memory as well as enhanced color resolution.

Up until now, to upgrade the C-128 to 64K of video RAM you would have to first search out the components, then find a competent repair outlet to desolder and install the parts. **What a hassle!**

SOLUTION — We have developed a module that simply plugs in to the mother board of your C-128. **No splattered solder — No heat damage — No hassle.**

This package includes full easy to follow installation instructions, a test program to validate proper installation and the plug-in upgrade module.

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NEW V2.0

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NEW V2.0

Here's what the world's toughest critics have to say.

If you think the toughest critics work for the magazines, you're wrong. The toughest critics are the people who actually use a program day in and day out. The people who depend on a program to do exactly what it says it will do. The people who pay out hard-earned money to buy a program — and who want to make sure they're getting their money's worth. The toughest critics aren't the people who review a program — they're the people who actually own the program.

Here's what some of those people have to say about Renegade:

- Thanks for (a) dream come true. *W.C., FL*
- We waited long enough! But, the best things come to (those) who wait. *C.P., CT*
- Very impressed!!! *T.W., MI*
- More than meets (my) expectations; great! *D.S., WI*
- Well worth the long wait!!!! *G.H., MO*
- Subscription service is a great innovation. *B.C., CA*
- Excellent! It's all I'll use! Keep up the good work. *J.D., NH*
- Finally, the last copier I'll need to buy!!!!!! *P.G., NC*
- Thanks for (your) user support! *A.S., TX*
- C64 owners have needed this for quite some time. *R.C., NY*

Renegade is a synthesis of the best utilities ever created by the best programmers ever assembled on a project of this nature. Not only is Renegade the only archival software a Commodore owner needs, it's so advanced it's now the only archival software we make. This means all our R&D effort goes into making sure that nothing else on the market comes close to Renegade's capabilities.

FEATURES INCLUDE:

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- 300+ Parms: For those tough to backup disks
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- Error Scanner with Unique Sector Editor
- Popular subscriber service available!
- Single or Dual High Speed Data Copier
- Directory Editor: Organize your Disks
- Geos™ Modual: PARAMETERS and TOOLS
- Compatible with C-64/128 with 1541/71 Drives
- Dump Parameter Catalog to Printer
- Scrolling M/L Monitor with Drive Mon
- Byte Pattern Scanner: High Speed Searches
- Technical support available: of course

Renegade comes with over 300 parameters, and additional parameters are available every two months! Also, Renegade program updates are available to registered owners 3 times a year to ensure that Renegade will always be a step ahead of anything else on the market.

In the software industry, companies live and die by consumer opinion. Some companies have to learn the hard way that people won't take unlimited abuse for very long. But in this volatile market, there's one thing we know for certain -- there are a lot of awfully tough critics out there saying things about us. And at Software Support International, we're working hard to make sure they keep right on talking.

Attention: Registered Renegade owners!
Parameter Modual #3 is now available, Only $9.95
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ALL NEW

THE 1581 TOOLKIT

The 1581 Disk Drive reborn.

ALL NEW

A gun without bullets is just a club. A car without fuel is just a big lawn ornament. And your 1581 drive without The 1581 Toolkit is little more than a high tech paperweight.

Our programming experts have spent almost a year developing and perfecting a complete set of essential utilities for the 1581. Utilities of such scope and power that they will enable your 1581 to transform the rest of your system into a sophisticated personal workstation for the 1990's.

These are the 10 utilities that you'll find in The 1581 Toolkit - utilities that turn the 1581's promise and potential into hard reality.

- Fast Disk Copier
- Track & Sector Editor
- Byte Pattern Searcher
- File Track & Sector Tracer
- Relocatable Fast Loader
- Fast File Copier
- Directory Editor
- Error Scanner
- Ultrafast Formatter
- Partition Creator

Some of the utilities may not sound familiar. Their names may not mean much to you yet. But they will. Because all 10 of these utilities have something in common. They're all indispensable to the serious 1581 owner. They're all designed to deliver cutting edge performance every time you use them, no bugs, no flaws, no excuses. And they're all from Software Support International, the company that removed the word "impossible" from Commodore's vocabulary.

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Supplied on a highspeed 3.5" disk.

Special: Now included **FREE** with each 1581 Toolkit is our new 1581 DOS Reference Guide. Over 100 pages of valuable inside information on your 1581. Written by David Martin (INFO magazine's Copy Corner reviewer), this manual is the most complete and intelligent volume available on the 1581 drive. Also includes a variety of handy utilities, including a M/L monitor with Drive Mon. It's all FREE with your 1581 Toolkit!

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Your SYSRES package includes over one hundred pages of detailed documentation, and a disk based program, as well as an Eprom for your Super Snapshot Cartridge.

SYSRES - Still only $39.95

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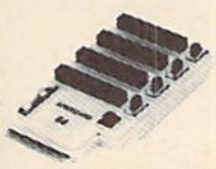

And you know how painful that can be.

Some of the best utilities on the market today are cartridge based. But, if you own more than one cartridge, it could be too much of a good thing.

Constantly plugging and unplugging a different cartridge puts a lot of stress on the user port of your Commodore. But there is an alternative.

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Aprospand 64 List: $29.95 Our price **$27.95** **Aprospand 10" extension cable** List: $19.95 Our price **$15.95**

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MLX Machine Language Entry Program For Commodore 64 and 128

Ottis R. Cowper

"MLX" is a labor-saving utility that allows almost fail-safe entry of machine language programs. Included are versions for the Commodore 64 and 128.

Type in and save some copies of whichever version of MLX is appropriate for your computer (you'll want to use it to enter future ML programs from COMPUTE!'s GAZETTE). Program 1 is for the Commodore 64, and Program 2 is for the 128 (128 MLX can also be used to enter Commodore 64 ML programs for use in 64 mode). When you're ready to enter an ML program, load and run MLX. It asks you for a starting address and an ending address. These addresses appear in the article accompanying the MLX-format program listing you're typing.

If you're unfamiliar with machine language, the addresses (and all other values you enter in MLX) may appear strange. Instead of the usual decimal numbers you're accustomed to, these numbers are in *hexadecimal*—a base 16 numbering system commonly used by ML programmers. Hexadecimal—hex for short—includes the numerals 0–9 and the letters A–F. But don't worry—even if you know nothing about ML or hex, you should have no trouble using MLX.

After you enter the starting and ending addresses, you'll be offered the option of clearing the workspace. Choose this option if you're starting to enter a new listing. If you're continuing a listing that's partially typed from a previous session, don't choose this option.

A functions menu will appear. The first option in the menu is ENTER DATA. If you're just starting to type in a program, pick this. Press the E key, and type the first number in the first line of the program listing. If you've already typed in part of a program, type the line number where you left off typing at the end of the previous session (be sure to load the partially completed program before you resume entry). In any case, make sure the address you enter corresponds to the address of a line in the listing you are entering. Otherwise, you'll be unable to enter the data correctly. If you pressed E by mistake, you can return to the command menu by pressing RETURN alone when asked for the address. (You can get back to the menu from most options by pressing RETURN with no other input.)

Entering A Listing

Once you're in Enter mode, MLX prints the address for each program line for you. You then type in all nine numbers on that line, beginning with the first two-digit number after the colon (:). Each line represents eight data bytes and a checksum. Although an MLX-format listing appears similar to the "hex dump" listings from a machine language monitor program, the extra checksum number on the end allows MLX to check your typing. (Commodore 128 users *can* enter the data from an MLX listing using the built-in monitor if the rightmost column of data is omitted, but we recommend against it. It's much easier to let MLX do the proofreading and error checking for you.)

When you enter a line, MLX recalculates the checksum from the eight bytes and the address and compares this value to the number from the ninth column. If the values match, you'll hear a bell tone, the data will be added to the workspace area, and the prompt for the next line of data will appear. But if MLX detects a typing error, you'll hear a low buzz and see an error message. The line will then be redisplayed for editing.

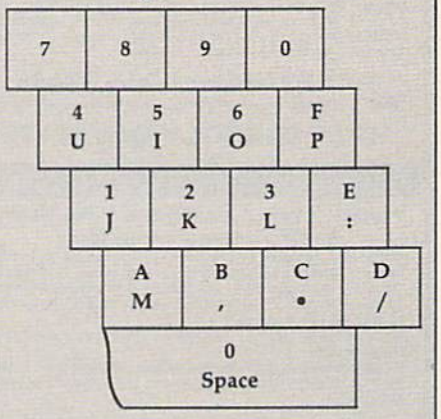
Invalid Characters Banned

Only a few keys are active while you're entering data, so you may have to unlearn some habits. You *do not* type spaces between the columns; MLX automatically inserts these for you. You *do not* press RETURN after typing the last number in a line; MLX automatically enters and checks the line after you type the last digit.

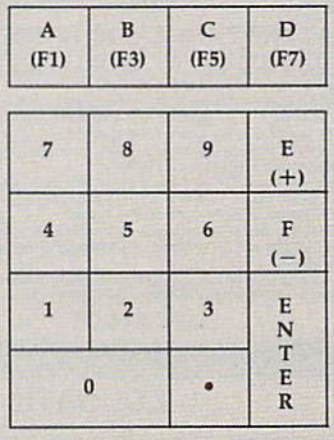
Only the numerals 0–9 and the letters A–F can be typed in. If you press any other key (with some exceptions noted below), you'll hear a warning buzz. To simplify typing, 128 MLX redefines the function keys and + and − keys on the numeric keypad so that you can enter data one-handed. (The 64 version incorporates the keypad modification from the March 1986 "Bug-Swatter" column, lines 485–487.) In either case, the keypad is active only while entering data. Addresses must be entered with the normal letter and number keys. The figures above show the keypad configurations for each version.

MLX checks for transposed characters. If you're supposed to type in A0 and instead enter 0A, MLX will catch your mistake. There is one error that can slip past MLX: Because of the checksum formula used, MLX won't notice if you accidentally type FF in place of 00, and vice versa. And there's a very slim chance that you could garble a line and still end up with a combination of characters that adds up to the proper checksum. However, these mistakes should not occur if you take reasonable care while entering data.

64 MLX Keypad



128 MLX Keypad



Editing Features

To correct typing mistakes before finishing a line, use the INST/DEL key to delete the character to the left of the cursor. (The cursor-left key also deletes.) If you mess up a line really badly, press CLR/HOME to start the line over. The RETURN key is also active, but only before any data is typed on a line. Pressing RETURN at this point returns you to the command menu. After you type a character of data, MLX disables RETURN until the cursor returns to the start of a line. Remember, you can press CLR/HOME to quickly get to a line

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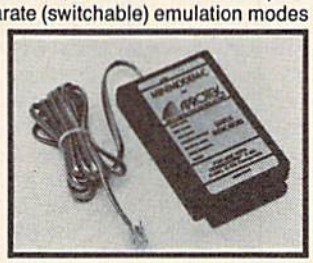

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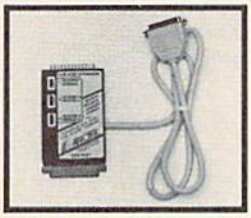

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number prompt.

More editing features are available when correcting lines in which MLX has detected an error. To make corrections in a line that MLX has redisplayed for editing, compare the line on the screen with the one printed in the listing, then move the cursor to the mistake and type the correct key. The cursor left and right keys provide the normal cursor controls. (The INST/DEL key now works as an alternative cursor-left key.) You cannot move left beyond the first character in the line. If you try to move beyond the rightmost character, you'll reenter the line. During editing, RETURN is active; pressing it tells MLX to recheck the line. You can press the CLR/HOME key to clear the entire line if you want to start from scratch, or if you want to get to a line number prompt to use RETURN to get back to the menu.

Display Data

The second menu choice, DISPLAY DATA, examines memory and shows the contents in the same format as the program listing (including the checksum). When you press D, MLX asks you for a starting address. Be sure that the starting address you give corresponds to a line number in the listing. Otherwise, the checksum display will be meaningless. MLX displays program lines until it reaches the end of the program, at which point the menu is redisplayed. You can pause the display by pressing the space bar. (MLX finishes printing the current line before halting.) Press space again to restart the display. To break out of the display and get back to the menu before the ending address is reached, press RETURN.

Other Menu Options

Two more menu selections let you save programs and load them back into the computer. These are SAVE FILE and LOAD FILE; their operation is quite straightforward. When you press S or L, MLX asks you for the filename. You'll then be asked to press either D or T to select disk or tape.

You'll notice the disk drive starting and stopping several times during a load or save (save only for the 128 version). Don't panic; this is normal behavior. MLX opens and reads from or writes to the file instead of using the usual LOAD and SAVE commands (128 MLX makes use of BLOAD). Disk users should also note that the drive prefix 0: is automatically added to the filename (line 750 in 64 MLX), so this should *not* be included when entering the name. This also precludes the use of @ for Save-with-Replace, so remember to give each version you save a different name. The 128 version makes up for this by giving you the option of scratching the existing file if you want to reuse a filename.

Remember that MLX saves the entire workspace area from the starting address to the ending address, so the save or load may take longer than you might expect if you've entered only a small amount of data from a long listing. When saving a partially completed listing, make sure to note the address where you stopped typing so you'll know where to resume entry when you reload.

MLX reports the standard disk or tape error messages if any problems are detected during the save or load. (Tape users should bear in mind that Commodore computers are never able to detect errors during a save to tape.) MLX also has three special load error messages: INCORRECT STARTING ADDRESS, which means the file you're trying to load does not have the starting address you specified when you ran MLX; LOAD ENDED AT *address*, which means the file you're trying to load ends before the ending address you specified when you started MLX; and TRUNCATED AT ENDING ADDRESS, which means the file you're trying to load extends beyond the ending address you specified when you started MLX. If you see one of these messages and feel certain that you've loaded the right file, exit and rerun MLX, being careful to enter the correct starting and ending addresses.

The 128 version also has a CATALOG DISK option so you can view the contents of the disk directory before saving or loading.

The QUIT menu option has the obvious effect—it stops MLX and enters BASIC. The RUN/STOP key is disabled, so the Q option lets you exit the program without turning off the computer. (Of course, RUN/STOP–RESTORE also gets you out.) You'll be asked for verification; press Y to exit to BASIC, or any other key to return to the menu. After quitting, you can type RUN again and reenter MLX without losing your data, as long as you don't use the clear workspace option.

The Finished Product

When you've finished typing all the data for an ML program and saved your work, you're ready to see the results. The instructions for loading and using the finished product vary from program to program. Some ML programs are designed to be loaded and run like BASIC programs, so all you need to type is LOAD *"filename"*,8 for disk (DLOAD *"filename"* on the 128) or LOAD *"filename"* for tape, and then RUN. Such programs will usually have a starting address of 0801 for the 64 or 1C01 for the 128. Other programs must be reloaded to specific addresses with a command such as LOAD *"filename"*,8,1 for disk (BLOAD *"filename"* on the 128) or LOAD *"filename"*,1,1 for tape, then started with a SYS to a particular memory address. On the Commodore 64, the most common starting address for such programs is 49152, which corresponds to MLX address C000. In either case, you should always refer to the article which accompanies the ML listing for information on loading and running the program.

An Ounce Of Prevention

By the time you finish typing in the data for a long ML program, you may have several hours invested in the project. Don't take chances—use our "Automatic Proofreader" to type the new MLX, and then test your copy *thoroughly* before first using it to enter any significant amount of data. Make sure all the menu options work as they should. Enter fragments of the program starting at several different addresses, then use the Display option to verify that the data has been entered correctly. And be sure to test the Save and Load options several times to ensure that you can recall your work from disk or tape. Don't let a simple typing error in the new MLX cost you several nights of hard work.

Program 1: MLX For Commodore 64

```
SS 10 REM VERSION 1.1: LINES 8
      30,950 MODIFIED, LINES 4
      85-487 ADDED
EK 100 POKE 56,50:CLR:DIM IN$,
      I,J,A,B,A$,B$,A(7),N$
DM 110 C4=48:C6=16:C7=7:Z2=2:Z
      4=254:Z5=255:Z6=256:Z7=
      127
CJ 120 FA=PEEK(45)+Z6*PEEK(46)
      :BS=PEEK(55)+Z6*PEEK(56
      ):H$="0123456789ABCDEF"
SB 130 R$=CHR$(13):L$="{LEFT}"
      :S$=" ":D$=CHR$(20):Z$=
      CHR$(0):T$="{13 RIGHT}"
CQ 140 SD=54272:FOR I=SD TO SD
      +23:POKE I,0:NEXT:POKE
      {SPACE}SD+24,15:POKE 78
      8,52
FC 150 PRINT"{CLR}"CHR$(142)CH
      R$(8):POKE 53280,15:POK
      E 53281,15
EJ 160 PRINT T$" {RED}{RVS}
      {2 SPACES}[8 @]
      {2 SPACES}"SPC(28)"
      {2 SPACES}{OFF}{BLU} ML
      X II {RED}{RVS}
      {2 SPACES}"SPC(28)"
      {12 SPACES}{BLU}"
FR 170 PRINT"{3 DOWN}
      {3 SPACES}COMPUTE!'S MA
      CHINE LANGUAGE EDITOR
      {3 DOWN}"
JB 180 PRINT"{BLK}STARTING ADD
```

```
      RESS[4]";:GOSUB300:SA=A
      D:GOSUB1040:IF F THEN18
      0
GF 190 PRINT"{BLK}{2 SPACES}EN
      DING ADDRESS[4]";:GOSUB
      300:EA=AD:GOSUB1030:IF
      {SPACE}F THEN190
KR 200 INPUT"{3 DOWN}{BLK}CLEA
      R WORKSPACE [Y/N][4]";A
      $:IF LEFT$(A$,1)<>"Y"TH
      EN220
PG 210 PRINT"{2 DOWN}{BLU}WORK
      ING...";:FORI=BS TO BS+
      EA-SA+7:POKE I,0:NEXT:P
      RINT"DONE"
DR 220 PRINTTAB(10)"{2 DOWN}
      {BLK}{RVS} MLX COMMAND
      {SPACE}MENU {DOWN}[4]":
      PRINT T$"{RVS}E{OFF}NTE
      R DATA"
BD 230 PRINT T$"{RVS}D{OFF}ISP
      LAY DATA":PRINT T$"
      {RVS}L{OFF}OAD FILE"
JS 240 PRINT T$"{RVS}S{OFF}AVE
       FILE":PRINT T$"{RVS}Q
      {OFF}UIT{2 DOWN}{BLK}"
JH 250 GET A$:IF A$=N$ THEN250
HK 260 A=0:FOR I=1 TO 5:IF A$=
      MID$("EDLSQ",I,1)THEN A
      =I:I=5
FD 270 NEXT:ON A GOTO420,610,6
      90,700,280:GOSUB1060:GO
      TO250
EJ 280 PRINT"{RVS} QUIT ":INPU
      T"{DOWN}[4]ARE YOU SURE
       [Y/N]";A$:IF LEFT$(A$,
      1)<>"Y"THEN220
EM 290 POKE SD+24,0:END
JX 300 IN$=N$:AD=0:INPUTIN$:IF
      LEN(IN$)<>4THENRETURN
KF 310 B$=IN$:GOSUB320:AD=A:B$
      =MID$(IN$,3):GOSUB320:A
      D=AD*256+A:RETURN
PP 320 A=0:FOR J=1 TO 2:A$=MID
      $(B$,J,1):B=ASC(A$)-C4+
      (A$>"@")*C7:A=A*C6+B
JA 330 IF B<0 OR B>15 THEN AD=
      0:A=-1:J=2
GX 340 NEXT:RETURN
CH 350 B=INT(A/C6):PRINT MID$(
      H$,B+1,1);:B=A-B*C6:PRI
      NT MID$(H$,B+1,1);:RETU
      RN
RR 360 A=INT(AD/Z6):GOSUB350:A
      =AD-A*Z6:GOSUB350:PRINT
      ":";
BE 370 CK=INT(AD/Z6):CK=AD-Z4*
      CK+Z5*(CK>Z7):GOTO390
PX 380 CK=CK*Z2+Z5*(CK>Z7)+A
JC 390 CK=CK+Z5*(CK>Z5):RETURN
QS 400 PRINT"{DOWN}STARTING AT
      [4]";:GOSUB300:IF IN$<>
      N$ THEN GOSUB1030:IF F
      {SPACE}THEN400
EX 410 RETURN
HD 420 PRINT"{RVS} ENTER DATA
      {SPACE}":GOSUB400:IF IN
      $=N$ THEN220
JK 430 OPEN3,3:PRINT
SK 440 POKE198,0:GOSUB360:IF F
       THEN PRINT IN$:PRINT"
      {UP}{5 RIGHT}";
GC 450 FOR I=0 TO 24 STEP 3:B$
      =S$:FOR J=1 TO 2:IF F T
      HEN B$=MID$(IN$,I+J,1)
HA 460 PRINT"{RVS}"B$L$;:IF I<
      24THEN PRINT"{OFF}";
HD 470 GET A$:IF A$=N$ THEN470
FK 480 IF(A$>"/"ANDA$<":")OR(A
      $>"@"ANDA$<"G")THEN540
GS 485 A=-(A$="M")-2*(A$=",")-
      3*(A$=".")-4*(A$="/")-5
      *(A$="J")-6*(A$="K")
FX 486 A=A-7*(A$="L")-8*(A$=":
      ")-9*(A$="U")-10*(A$="I
      ")-11*(A$="O")-12*(A$="
      P")
CM 487 A=A-13*(A$=S$):IF A THE
      N A$=MID$("ABCD123E456F
      0",A,1):GOTO 540
MP 490 IF A$=R$ AND((I=0)AND(J
      =1)OR F)THEN PRINT B$;:
      J=2:NEXT:I=24:GOTO550
KC 500 IF A$="{HOME}" THEN PRI
      NT B$:J=2:NEXT:I=24:NEX
      T:F=0:GOTO440
MX 510 IF(A$="{RIGHT}")ANDF TH
      ENPRINT B$L$;:GOTO540
GK 520 IF A$<>L$ AND A$<>D$ OR
      ((I=0)AND(J=1))THEN GOS
      UB1060:GOTO470
HG 530 A$=L$+S$+L$:PRINT B$L$;
      :J=2-J:IF J THEN PRINT
      {SPACE}L$;:I=I-3
QS 540 PRINT A$;:NEXT J:PRINT
      {SPACE}S$;
PM 550 NEXT I:PRINT:PRINT"{UP}
      {5 RIGHT}";:INPUT#3,IN$
      :IF IN$=N$ THEN CLOSE3:
      GOTO220
QC 560 FOR I=1 TO 25 STEP3:B$=
      MID$(IN$,I):GOSUB320:IF
       I<25 THEN GOSUB380:A(I
      /3)=A
PK 570 NEXT:IF A<>CK THEN GOSU
      B1060:PRINT"{BLK}{RVS}
      {SPACE}ERROR: REENTER L
      INE [4]":F=1:GOTO440
HJ 580 GOSUB1080:B=BS+AD-SA:FO
      R I=0 TO 7:POKE B+I,A(I
      ):NEXT
QQ 590 AD=AD+8:IF AD>EA THEN C
      LOSE3:PRINT"{DOWN}{BLU}
      ** END OF ENTRY **{BLK}
      {2 DOWN}":GOTO700
GQ 600 F=0:GOTO440
QA 610 PRINT"{CLR}{DOWN}{RVS}
      {SPACE}DISPLAY DATA ":G
      OSUB400:IF IN$=N$ THEN2
      20
RJ 620 PRINT"{DOWN}{BLU}PRESS:
       {RVS}SPACE{OFF} TO PAU
      SE, {RVS}RETURN{OFF} TO
       BREAK[4]{DOWN}"
KS 630 GOSUB360:B=BS+AD-SA:FOR
      I=BTO B+7:A=PEEK(I):GOS
      UB350:GOSUB380:PRINT S$
      ;
CC 640 NEXT:PRINT"{RVS}";:A=CK
      :GOSUB350:PRINT
KH 650 F=1:AD=AD+8:IF AD>EA TH
      ENPRINT"{DOWN}{BLU}** E
      ND OF DATA **":GOTO220
KC 660 GET A$:IF A$=R$ THEN GO
      SUB1080:GOTO220
EQ 670 IF A$=S$ THEN F=F+1:GOS
      UB1080
AD 680 ONFGOTO630,660,630
CM 690 PRINT"{DOWN}{RVS} LOAD
      {SPACE}DATA ":OP=1:GOTO
      710
PC 700 PRINT"{DOWN}{RVS} SAVE
      {SPACE}FILE ":OP=0
RX 710 IN$=N$:INPUT"{DOWN}FILE
      NAME[4]";IN$:IF IN$=N$
      {SPACE}THEN220
PR 720 F=0:PRINT"{DOWN}{BLK}
      {RVS}T{OFF}APE OR {RVS}
      D{OFF}ISK: [4]";
FP 730 GET A$:IF A$="T"THEN PR
      INT"T{DOWN}":GOTO880
HQ 740 IF A$<>"D"THEN730
HH 750 PRINT"D{DOWN}":OPEN15,8
      ,15,"I0:":B=EA-SA:IN$="
      0:"+IN$:IF OP THEN810
SQ 760 OPEN 1,8,8,IN$+",P,W":G
      OSUB860:IF A THEN220
FJ 770 AH=INT(SA/256):AL=SA-(A
      H*256):PRINT#1,CHR$(AL)
      ;CHR$(AH);
PE 780 FOR I=0 TO B:PRINT#1,CH
      R$(PEEK(BS+I));:IF ST T
      HEN800
FC 790 NEXT:CLOSE1:CLOSE15:GOT
      O940
GS 800 GOSUB1060:PRINT"{DOWN}
      {BLK}ERROR DURING SAVE:
      [4]":GOSUB860:GOTO220
MA 810 OPEN 1,8,8,IN$+",P,R":G
      OSUB860:IF A THEN220
GE 820 GET#1,A$,B$:AD=ASC(A$+Z
      $)+256*ASC(B$+Z$):IF AD
      <>SA THEN F=1:GOTO850
RX 830 FOR I=0 TO B:GET#1,A$:P
      OKE BS+I,ASC(A$+Z$):IF(
      I<>B)AND ST THEN F=2:AD
      =I:I=B
FA 840 NEXT:IF ST<>64 THEN F=3
FQ 850 CLOSE1:CLOSE15:ON ABS(F
      >0)+1 GOTO960,970
SA 860 INPUT#15,A,A$:IF A THEN
       CLOSE1:CLOSE15:GOSUB10
      60:PRINT"{RVS}ERROR: "A
      $
GQ 870 RETURN
EJ 880 POKE183,PEEK(FA+2):POKE
      187,PEEK(FA+3):POKE188,
      PEEK(FA+4):IFOP=0THEN92
      0
HJ 890 SYS 63466:IF(PEEK(783)A
      ND1)THEN GOSUB1060:PRIN
      T"{DOWN}{RVS} FILE NOT
      {SPACE}FOUND ":GOTO690
CS 900 AD=PEEK(829)+256*PEEK(8
      30):IF AD<>SA THEN F=1:
      GOTO970
SC 910 A=PEEK(831)+256*PEEK(83
      2)-1:F=F-2*(A<EA)-3*(A>
      EA):AD=A-AD:GOTO930
KM 920 A=SA:B=EA+1:GOSUB1010:P
      OKE780,3:SYS 63338
JF 930 A=BS:B=BS+(EA-SA)+1:GOS
      UB1010:ON OP GOTO950:SY
      S 63591
AE 940 GOSUB1080:PRINT"{BLU}**
       SAVE COMPLETED **":GOT
      O220
XP 950 POKE147,0:SYS 63562:IF
      {SPACE}ST>0 THEN970
FR 960 GOSUB1080:PRINT"{BLU}**
       LOAD COMPLETED **":GOT
      O220
DP 970 GOSUB1060:PRINT"{BLK}
      {RVS}ERROR DURING LOAD:
      {DOWN}[4]":ON F GOSUB98
      0,990,1000:GOTO220
PP 980 PRINT"INCORRECT STARTIN
      G ADDRESS (";:GOSUB360:
      PRINT")":RETURN
GR 990 PRINT"LOAD ENDED AT ";:
      AD=SA+AD:GOSUB360:PRINT
       D$:RETURN
FD 1000 PRINT"TRUNCATED AT END
      ING ADDRESS":RETURN
RX 1010 AH=INT(A/256):AL=A-(AH
      *256):POKE193,AL:POKE1
      94,AH
FF 1020 AH=INT(B/256):AL=B-(AH
      *256):POKE174,AL:POKE1
      75,AH:RETURN
FX 1030 IF AD<SA OR AD>EA THEN
      1050
HA 1040 IF(AD>511 AND AD<40960
```

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```
        )OR(AD>49151 AND AD<53
        248)THEN GOSUB1080:F=0
        :RETURN
HC 1050 GOSUB1060:PRINT"{RVS}
        {SPACE}INVALID ADDRESS
         {DOWN}{BLK}":F=1:RETU
        RN
AR 1060 POKE SD+5,31:POKE SD+6
        ,208:POKE SD,240:POKE
        {SPACE}SD+1,4:POKE SD+
        4,33
DX 1070 FOR S=1 TO 100:NEXT:GO
        TO1090
PF 1080 POKE SD+5,8:POKE SD+6,
        240:POKE SD,0:POKE SD+
        1,90:POKE SD+4,17
AC 1090 FOR S=1 TO 100:NEXT:PO
        KE SD+4,0:POKE SD,0:PO
        KE SD+1,0:RETURN
```

Program 2: MLX For Commodore 128

```
AE 100 TRAP 960:POKE 4627,128:
       DIM NL$,A(7)
XP 110 Z2=2:Z4=254:Z5=255:Z6=2
       56:Z7=127:BS=256*PEEK(4
       627):EA=65280
FB 120 BE$=CHR$(7):RT$=CHR$(13
       ):DL$=CHR$(20):SP$=CHR$
       (32):LF$=CHR$(157)
KE 130 DEF FNHB(A)=INT(A/256):
       DEF FNLB(A)=A-FNHB(A)*2
       56:DEF FNAD(A)=PEEK(A)+
       256*PEEK(A+1)
JB 140 KEY 1,"A":KEY 3,"B":KEY
        5,"C":KEY 7,"D":VOL 15
       :IF RGR(0)=5 THEN FAST
FJ 150 PRINT"{CLR}"CHR$(142);C
       HR$(8):COLOR 0,15:COLOR
        4,15:COLOR 6,15
GQ 160 PRINT TAB(12)"{RED}
       {RVS}{2 SPACES}{9 @}
       {2 SPACES}"RT$;TAB(12)"
       {RVS}{2 SPACES}{OFF}
       {BLU} 128 MLX {RED}
       {RVS}{2 SPACES}"RT$;TAB
       (12)"{RVS}{13 SPACES}
       {BLU}"
FE 170 PRINT"{2 DOWN}
       {3 SPACES}COMPUTE!'S MA
       CHINE LANGUAGE EDITOR
       {2 DOWN}"
DK 180 PRINT"{BLK}STARTING ADD
       RESS{4}":GOSUB 260:IF
       {SPACE}AD THEN SA=AD:EL
       SE 180
FH 190 PRINT"{BLK}{2 SPACES}EN
       DING ADDRESS{4}":GOSUB
        260:IF AD THEN EA=AD:E
       LSE 190
MF 200 PRINT"{DOWN}{BLK}CLEAR
       {SPACE}WORKSPACE [Y/N]?
       {4}":GETKEY A$:IF A$<>"
       Y" THEN 220
QH 210 PRINT"{DOWN}{BLU}WORKIN
       G...":BANK 0:FOR A=BS
       {SPACE}TO BS+(EA-SA)+7:
       POKE A,0:NEXT A:PRINT"D
       ONE"
DC 220 PRINT TAB(10)"{DOWN}
       {BLK}{RVS} MLX COMMAND
       {SPACE}MENU {4}{DOWN}":
       PRINT TAB(13)"{RVS}E
       {OFF}NTER DATA"RT$;TAB(
       13)"{RVS}D{OFF}ISPLAY D
       ATA"RT$;TAB(13)"{RVS}L
       {OFF}OAD FILE"
HB 230 PRINT TAB(13)"{RVS}S
       {OFF}AVE FILE"RT$;TAB(1
       3)"{RVS}C{OFF}ATALOG DI
       SK"RT$;TAB(13)"{RVS}Q
       {OFF}UIT{DOWN}{BLK}"
AP 240 GETKEY A$:A=INSTR("EDLS
       CQ",A$):ON A GOTO 340,5
       50,640,650,930,940:GOSU
       B 950:GOTO 240
SX 250 PRINT"STARTING AT";:GOS
       UB 260:IF(AD<>0)OR(A$=N
       L$)THEN RETURN:ELSE 250
BG 260 A$=NL$:INPUT A$:IF LEN(
       A$)=4 THEN AD=DEC(A$)
PP 270 IF AD=0 THEN BEGIN:IF A
       $<>NL$ THEN 300:ELSE RE
       TURN:BEND
MA 280 IF AD<SA OR AD>EA THEN
       {SPACE}300
PM 290 IF AD>511 AND AD<65280
       {SPACE}THEN PRINT BE$;:
       RETURN
SQ 300 GOSUB 950:PRINT"{RVS} I
       NVALID ADDRESS {DOWN}
       {BLK}":AD=0:RETURN
RD 310 CK=FNHB(AD):CK=AD-Z4*CK
       +Z5*(CK>Z7):GOTO 330
DD 320 CK=CK*Z2+Z5*(CK>Z7)+A
AH 330 CK=CK+Z5*(CK>Z5):RETURN
QD 340 PRINT BE$;"{RVS} ENTER
       {SPACE}DATA ":GOSUB 250
       :IF A$=NL$ THEN 220
JA 350 BANK 0:PRINT:F=0:OPEN 3
       ,3
BR 360 GOSUB 310:PRINT HEX$(AD
       )+":";:IF F THEN PRINT
       {SPACE}L$:PRINT"{UP}
       {5 RIGHT}";
QA 370 FOR I=0 TO 24 STEP 3:B$
       =SP$:FOR J=1 TO 2:IF F
       {SPACE}THEN B$=MID$(L$,
       I+J,1)
PS 380 PRINT"{RVS}"B$+LF$;:IF
       {SPACE}I<24 THEN PRINT"
       {OFF}";
RC 390 GETKEY A$:IF (A$>"/" AN
       D A$<":") OR(A$>"@" AND
        A$<"G") THEN 470
AC 400 IF A$="+" THEN A$="E":G
       OTO 470
QB 410 IF A$="-" THEN A$="F":G
       OTO 470
FB 420 IF A$=RT$ AND ((I=0) AN
       D (J=1) OR F) THEN PRIN
       T B$;:J=2:NEXT:I=24:GOT
       O 480
RD 430 IF A$="{HOME}" THEN PRI
       NT B$:J=2:NEXT:I=24:NEX
       T:F=0:GOTO 360
XB 440 IF (A$="{RIGHT}") AND F
        THEN PRINT B$+LF$;:GOT
       O 470
JP 450 IF A$<>LF$ AND A$<>DL$
       {SPACE}OR ((I=0) AND (J
       =1)) THEN GOSUB 950:GOT
       O 390
PS 460 A$=LF$+SP$+LF$:PRINT B$
       +LF$;:J=2-J:IF J THEN P
       RINT LF$;:I=I-3
GB 470 PRINT A$;:NEXT J:PRINT
       {SPACE}SP$;
HA 480 NEXT I:PRINT:PRINT"{UP}
       {5 RIGHT}";:L$="
       {27 SPACES}"
DP 490 FOR I=1 TO 25 STEP 3:GE
       T#3,A$,B$:IF A$=SP$ THE
       N I=25:NEXT:CLOSE 3:GOT
       O 220
BA 500 A$=A$+B$:A=DEC(A$):MID$
       (L$,I,2)=A$:IF I<25 THE
       N GOSUB 320:A(I/3)=A:GE
       T#3,A$
AR 510 NEXT I:IF A<>CK THEN GO
       SUB 950:PRINT:PRINT"
       {RVS} ERROR: REENTER LI
       NE ":F=1:GOTO 360
DX 520 PRINT BE$:B=BS+AD-SA:FO
       R I=0 TO 7:POKE B+I,A(I
       ):NEXT I
XB 530 F=0:AD=AD+8:IF AD<=EA T
       HEN 360
CA 540 CLOSE 3:PRINT"{DOWN}
       {BLU}** END OF ENTRY **
       {BLK}{2 DOWN}":GOTO 650
MC 550 PRINT BE$;"{CLR}{DOWN}
       {RVS} DISPLAY DATA ":GO
       SUB 250:IF A$=NL$ THEN
       {SPACE}220
JF 560 BANK 0:PRINT"{DOWN}
       {BLU}PRESS: {RVS}SPACE
       {OFF} TO PAUSE, {RVS}RE
       TURN{OFF} TO BREAK{4}
       {DOWN}"
XA 570 PRINT HEX$(AD)+":";:GOS
       UB 310:B=BS+AD-SA
DJ 580 FOR I=B TO B+7:A=PEEK(I
       ):PRINT RIGHT$(HEX$(A),
       2);SP$;:GOSUB 320:NEXT
       {SPACE}I
XB 590 PRINT"{RVS}";RIGHT$(HEX
       $(CK),2)
GR 600 F=1:AD=AD+8:IF AD>EA TH
       EN PRINT"{BLU}** END OF
        DATA **":GOTO 220
EB 610 GET A$:IF A$=RT$ THEN P
       RINT BE$:GOTO 220
QK 620 IF A$=SP$ THEN F=F+1:PR
       INT BE$;
XS 630 ON F GOTO 570,610,570
RF 640 PRINT BE$"{DOWN}{RVS} L
       OAD DATA ":OP=1:GOTO 66
       0
BP 650 PRINT BE$"{DOWN}{RVS} S
       AVE FILE ":OP=0
DM 660 F=0:F$=NL$:INPUT"FILENA
       ME{4}";F$:IF F$=NL$ THE
       N 220
PF 665 IF LEN(F$)>14 THEN 660
RF 670 PRINT"{DOWN}{BLK}{RVS}T
       {OFF}APE OR {RVS}D{OFF}
       ISK: {4}";
SQ 680 GETKEY A$:IF A$="T" THE
       N 850:ELSE IF A$<>"D" T
       HEN 680
SP 690 PRINT"DISK{DOWN}":IF OP
        THEN 760
EH 700 DOPEN#1,(F$+",P"),W:IF
       {SPACE}DS THEN A$=D$:GO
       TO 740
JH 710 BANK 0:POKE BS-2,FNLB(S
       A):POKE BS-1,FNHB(SA):P
       RINT"SAVING ";F$:PRINT
MC 720 FOR A=BS-2 TO BS+EA-SA:
       PRINT#1,CHR$(PEEK(A));:
       IF ST THEN A$="DISK WRI
       TE ERROR":GOTO 750
GC 730 NEXT A:CLOSE 1:PRINT"
       {BLU}** SAVE COMPLETED
       {SPACE}WITHOUT ERRORS *
       *":GOTO 220
RA 740 IF DS=63 THEN BEGIN:CLO
       SE 1:INPUT"{BLK}REPLACE
        EXISTING FILE [Y/N]{4}
       ";A$:IF A$="Y" THEN SCR
       ATCH(F$):PRINT:GOTO 700
       :ELSE PRINT"{BLK}":GOTO
        660:BEND
GA 750 CLOSE 1:GOSUB 950:PRINT
       "{BLK}{RVS} ERROR DURIN
       G SAVE: {4}":PRINT A$:G
       OTO 220
FD 760 DOPEN#1,(F$+",P"):IF DS
        THEN A$=DS$:F=4:CLOSE
       {SPACE}1:GOTO 790
```

```
PX 770 GET#1,A$,B$:CLOSE 1:AD=
       ASC(A$)+256*ASC(B$):IF
       {SPACE}AD<>SA THEN F=1:
       GOTO 790
KB 780 PRINT"LOADING ";F$:PRIN
       T:BLOAD(F$),B0,P(BS):AD
       =SA+FNAD(174)-BS-1:F=-2
       *(AD<EA)-3*(AD>EA)
RQ 790 IF F THEN 800:ELSE PRIN
       T"{BLU}** LOAD COMPLETE
       D WITHOUT ERRORS **":GO
       TO 220
ER 800 GOSUB 950:PRINT"{BLK}
       {RVS} ERROR DURING LOAD
       : {4#}":ON F GOSUB 810,8
       20,830,840:GOTO220
QJ 810 PRINT"INCORRECT STARTIN
       G ADDRESS (";HEX$(AD);"
       )":RETURN
DP 820 PRINT"LOAD ENDED AT ";H
       EX$(AD):RETURN
EB 830 PRINT"TRUNCATED AT ENDI
       NG ADDRESS ("HEX$(EA)")
       ":RETURN
FP 840 PRINT"DISK ERROR ";A$:R
       ETURN
KS 850 PRINT"TAPE":AD=POINTER(
       F$):BANK 1:A=PEEK(AD):A
       L=PEEK(AD+1):AH=PEEK(AD
       +2)
XX 860 BANK 15:SYS DEC("FF68")
       ,0,1:SYS DEC("FFBA"),1,
       1,0:SYS DEC("FFBD"),A,A
       L,AH:SYS DEC("FF90"),12
       8:IF OP THEN 890
FG 870 PRINT:A=SA:B=EA+1:GOSUB
        920:SYS DEC("E919"),3:
       PRINT"SAVING ";F$
AB 880 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("EA18"):
       PRINT"{DOWN}{BLU}** TAP
       E SAVE COMPLETED **":GO
       TO 220
CP 890 SYS DEC("E99A"):PRINT:I
       F PEEK(2816)=5 THEN GOS
       UB 950:PRINT"{DOWN}
       {BLK}{RVS} FILE NOT FOU
       ND ":GOTO 220
GQ 900 PRINT"LOADING ...{DOWN}
       ":AD=FNAD(2817):IF AD<>
       SA THEN F=1:GOTO 800:EL
       SE AD=FNAD(2819)-1:F=-2
       *(AD<EA)-3*(AD>EA)
JD 910 A=BS:B=BS+(EA-SA)+1:GOS
       UB 920:SYS DEC("E9FB"):
       IF ST>0 THEN 800:ELSE 7
       90
XB 920 POKE193,FNLB(A):POKE194
       ,FNHB(A):POKE 174,FNLB(
       B):POKE 175,FNHB(B):RET
       URN
CP 930 CATALOG:PRINT"{DOWN}
       {BLU}** PRESS ANY KEY F
       OR MENU **":GETKEY A$:G
       OTO 220
MM 940 PRINT BE$"{RVS} QUIT
       {4}";RT$;"ARE YOU SURE
       {SPACE}{Y/N}?":GETKEY A
       $:IF A$<>"Y" THEN 220:E
       LSE PRINT"{CLR}":BANK 1
       5:END
JE 950 SOUND 1,500,10:RETURN
AF 960 IF ER=14 AND EL=260 THE
       N RESUME 300
MK 970 IF ER=14 AND EL=500 THE
       N RESUME NEXT
KJ 980 IF ER=4 AND EL=780 THEN
        F=4:A$=DS$:RESUME 800
DQ 990 IF ER=30 THEN RESUME:EL
       SE PRINT ERR$(ER);" ERR
       OR IN LINE";EL
```


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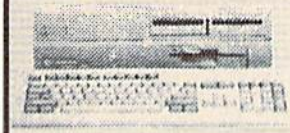

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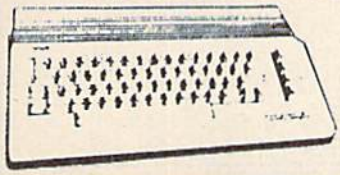

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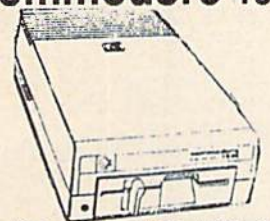

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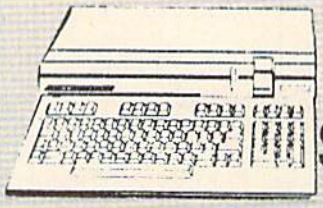

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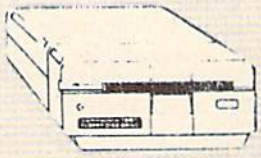

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Next, type RUN and press RETURN. After announcing which computer it's running on, the Proofreader displays the message "Proofreader Active". Now you're ready to type in a BASIC program.

Every time you finish typing a line and press RETURN, the Proofreader displays a two-letter checksum in the upper-left corner of the screen. Compare this result with the two-letter checksum printed to the left of the line in the program listing. If the letters match, it's almost certain the line was typed correctly. If the letters don't match, check for your mistake and correct the line.

The Proofreader ignores spaces not enclosed in quotes, so you can omit or add spaces between keywords and still see a matching checksum. However, since spaces inside quotes are almost always significant, the Proofreader pays attention to them. For example, **10 PRINT"THIS IS BASIC"** will generate a different checksum than **10 PRINT"THIS ISBA SIC"**.

A common typing error is transposition—typing two successive characters in the wrong order, like PIRNT instead of PRINT or 64378 instead of 64738. The Proofreader is sensitive to the *position* of each character within the line and thus catches transposition errors.

The Proofreader does *not* accept keyword abbreviations (for example, ? instead of PRINT). If you prefer to use abbreviations, you can still check the line by LISTing it after typing it in, moving the cursor back to the line, and pressing RETURN. LISTing the line substitutes the full keyword for the abbreviation and allows the Proofreader to work properly. The same technique works for rechecking programs you've already typed in.

If you're using the Proofreader on the Commodore 128, Plus/4, or 16, *do not perform any GRAPHIC commands while the Proofreader is active.* When you perform a command like GRAPHIC 1, the computer moves everything at the start of BASIC program space—including the Proofreader—to another memory area, causing the Proofreader to crash. The same thing happens if you *run* any program with a GRAPHIC command while the Proofreader is in memory.

Though the Proofreader doesn't interfere with other BASIC operations, it's a good idea to disable it before running another program. However, the Proofreader is purposely difficult to dislodge: It's not affected by tape or disk operations, or by pressing RUN/STOP– RESTORE. The simplest way to disable it is to turn the computer off then on. A gentler method is to SYS to the computer's built-in reset routine (SYS 65341 for the 128, 64738 for the 64, and 65526 for the Plus/4 and 16). These reset routines erase any program in memory, so be sure to save the program you're typing in before entering the SYS command.

If you own a Commodore 64, you may already have wondered whether the Proofreader works with other programming utilities like "MetaBASIC." The answer is generally yes, *if you're using a 64 and activate the Proofreader after installing the other utility.* For example, first load and activate MetaBASIC, then load and run the Proofreader.

When using the Proofreader with another utility, you should disable *both* programs before running a BASIC program. While the Proofreader seems unaffected by most utilities, there's no way to promise that it will work with any and every combination of utilities you might want to use. The more utilities activated, the more fragile the system becomes.

The New Automatic Proofreader

```
10 VEC=PEEK(772)+256*PEEK(773)
   :LO=43:HI=44
20 PRINT "AUTOMATIC PROOFREADE
   R FOR ";:IF VEC=42364 THEN
   {SPACE}PRINT "C-64"
30 IF VEC=50556 THEN PRINT "VI
   C-20"
40 IF VEC=35158 THEN GRAPHIC C
   LR:PRINT "PLUS/4 & 16"
50 IF VEC=17165 THEN LO=45:HI=
   46:GRAPHIC CLR:PRINT"128"
60 SA=(PEEK(LO)+256*PEEK(HI))+
   6:ADR=SA
70 FOR J=0 TO 166:READ BYT:POK
   E ADR,BYT:ADR=ADR+1:CHK=CHK
   +BYT:NEXT
80 IF CHK<>20570 THEN PRINT "*
   ERROR* CHECK TYPING IN DATA
    STATEMENTS":END
90 FOR J=1 TO 5:READ RF,LF,HF:
   RS=SA+RF:HB=INT(RS/256):LB=
   RS-(256*HB)
100 CHK=CHK+RF+LF+HF:POKE SA+L
   F,LB:POKE SA+HF,HB:NEXT
110 IF CHK<>22054 THEN PRINT "
   *ERROR* RELOAD PROGRAM AND
   {SPACE}CHECK FINAL LINE":EN
   D
120 POKE SA+149,PEEK(772):POKE
    SA+150,PEEK(773)
130 IF VEC=17165 THEN POKE SA+
   14,22:POKE SA+18,23:POKESA+
   29,224:POKESA+139,224
140 PRINT CHR$(147);CHR$(17);"
   PROOFREADER ACTIVE":SYS SA
150 POKE HI,PEEK(HI)+1:POKE (P
   EEK(LO)+256*PEEK(HI))-1,0:N
   EW
160 DATA 120,169,73,141,4,3,16
   9,3,141,5,3
170 DATA 88,96,165,20,133,167,
   165,21,133,168,169
180 DATA 0,141,0,255,162,31,18
   1,199,157,227,3
190 DATA 202,16,248,169,19,32,
   210,255,169,18,32
200 DATA 210,255,160,0,132,180
   ,132,176,136,230,180
210 DATA 200,185,0,2,240,46,20
   1,34,208,8,72
220 DATA 165,176,73,255,133,17
   6,104,72,201,32,208
230 DATA 7,165,176,208,3,104,2
   08,226,104,166,180
240 DATA 24,165,167,121,0,2,13
   3,167,165,168,105
250 DATA 0,133,168,202,208,239
   ,240,202,165,167,69
260 DATA 168,72,41,15,168,185,
   211,3,32,210,255
270 DATA 104,74,74,74,74,168,1
   85,211,3,32,210
280 DATA 255,162,31,189,227,3,
   149,199,202,16,248
290 DATA 169,146,32,210,255,76
   ,86,137,65,66,67
300 DATA 68,69,70,71,72,74,75,
   77,80,81,82,83,88
310 DATA 13,2,7,167,31,32,151,
   116,117,151,128,129,167,136
   ,137
```

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How To Type In *COMPUTE!'s Gazette* Programs

Each month, COMPUTE!'s Gazette publishes programs for the Commodore 128, 64, Plus/4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. All 64 programs run on the 128 in 64 mode. Be sure to read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We frequently publish two programs designed to make typing easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then on, erasing what was in memory. So be sure to *save a program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 SPACES} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example, enter eight SHIFTed A's).

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + ↑ CRSR ↓	
{DOWN}	↑ CRSR ↓	
{LEFT}	SHIFT + ← CRSR →	
{RIGHT}	← CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{ F1 }	f1	
{ F2 }	SHIFT + f1	
{ F3 }	f3	
{ F4 }	SHIFT + f3	
{ F5 }	f5	
{ F6 }	SHIFT + f5	
{ F7 }	f7	
{ F8 }	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

When You Read:	Press:	See:
[1]	COMMODORE + 1	
[2]	COMMODORE + 2	
[3]	COMMODORE + 3	
[4]	COMMODORE + 4	
[5]	COMMODORE + 5	
[6]	COMMODORE + 6	
[7]	COMMODORE + 7	
[8]	COMMODORE + 8	

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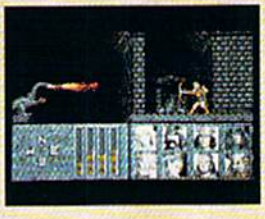

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